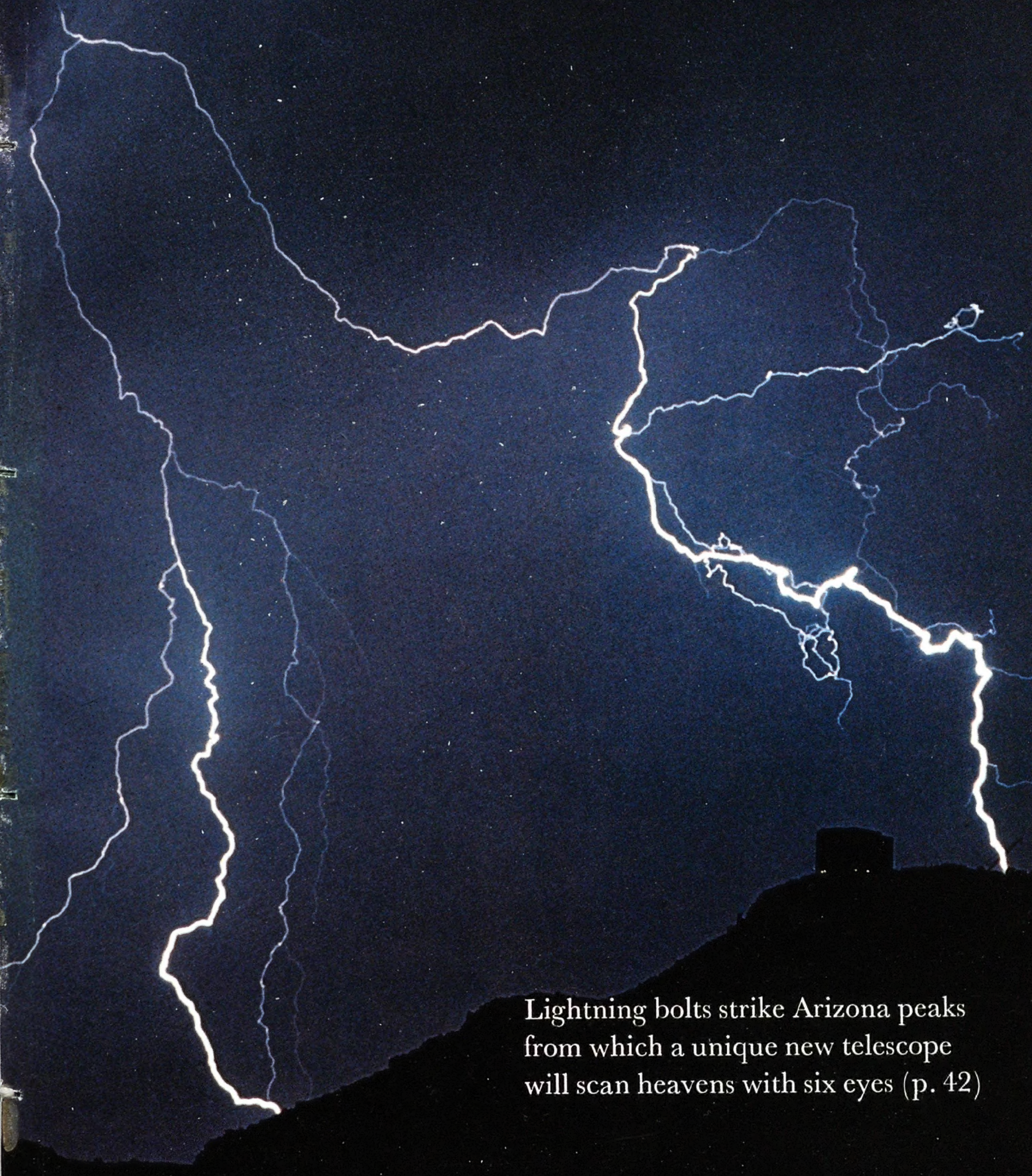
May 1979

Smithsonian



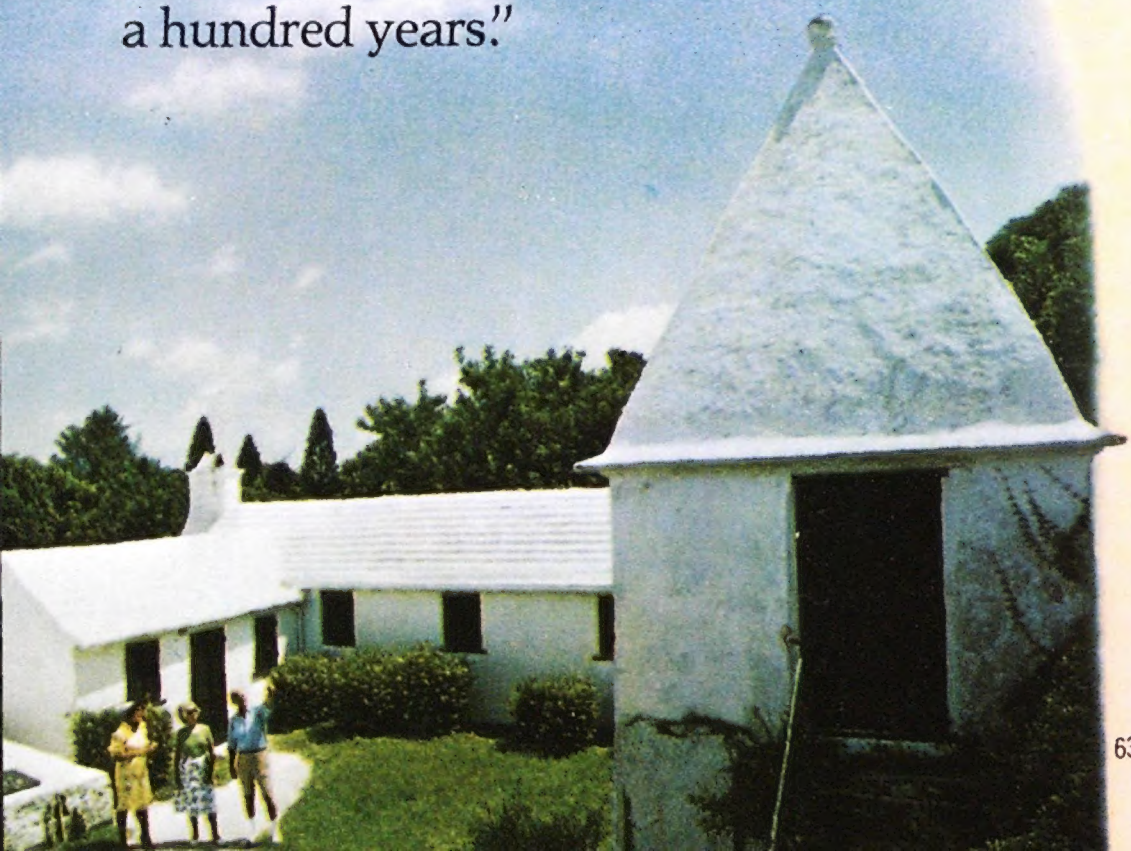
Lightning bolts strike Arizona peaks from which a unique new telescope will scan heavens with six eyes (p. 42)

Bermuda. Get away to it all!

"The lifestyle in Bermuda appeals to us very much. Golf, swimming, tennis, the beach. Everything you want, at your fingertips."

Stephen and Ann Bell talk about the Bells' second visit to Bermuda.

"The architecture is a delight. It's nice to see a house exactly as it was. Like stepping back a hundred years."



"I don't see how Bermuda can be improved upon. This is only the second time we've been here. But it's not going to be the last."

See your travel agent or write Bermuda, Dept. 133
630 Fifth Avenue, N.Y., N.Y. 10020 or Suite 1010, 44 School St., Boston, Mass. 02108
or 300 North State Street, Chicago, Ill. 60610

How to buy a typewriter.

—Clip and save—

Choosing a portable typewriter isn't hard if you know what to look for. This brief guide will help you make the best choice.

Test the feel. Check the slope and height of the keyboard. Check the size and shape of the keys. Make sure the controls are uncrowded and easy to reach.

Test the feel of a Smith-Corona® electric typewriter against several other brands. We welcome the comparison.

Try the touch. A responsive touch makes for better, easier typing. Look for a touch that is prompt, easy and dependable.

When you test a Smith-Corona, for instance, note how smartly the carriage returns. Press a button—zip—the carriage is back where it started.

Listen to the sound—the typewriter is trying to tell you something. If it sounds tinny, beware. This may indicate that the construction is too light.

Note the look of the type. Lines and individual letters should be straight. The impression should be crisp, clean and even. The print quality should not vary over the page.

Check the overall design. Good design is part of good value, so choose an attractive modern instrument. The Smith-Corona shown is an example of classic, good design.

Look at the carrying case. Does it have double walls for air-cushioned protection? Does it have sturdy latches, locks and hinges? The Smith-Corona case does.

Check the price. A typewriter that sells for substantially less than others might be substantially less typewriter. If the price difference is minimal, you're probably better off paying a few extra dollars for the typewriter that tests best.

Ask who makes it. Smith-Corona makes every single typewriter that bears its name, not true of most other brands. So consider the maker's reputation. A company with a solid reputation will still be around tomorrow and in the future to give your typewriter necessary service and maintenance.

A note about ribbon systems. Smith-Corona offers a unique cartridge ribbon and cartridge correction system. It lets you change ribbons in seconds without touching the ribbon. It also lets you correct typing errors neatly, quickly and easily. Not all correction systems produce equally good results. Test and compare.

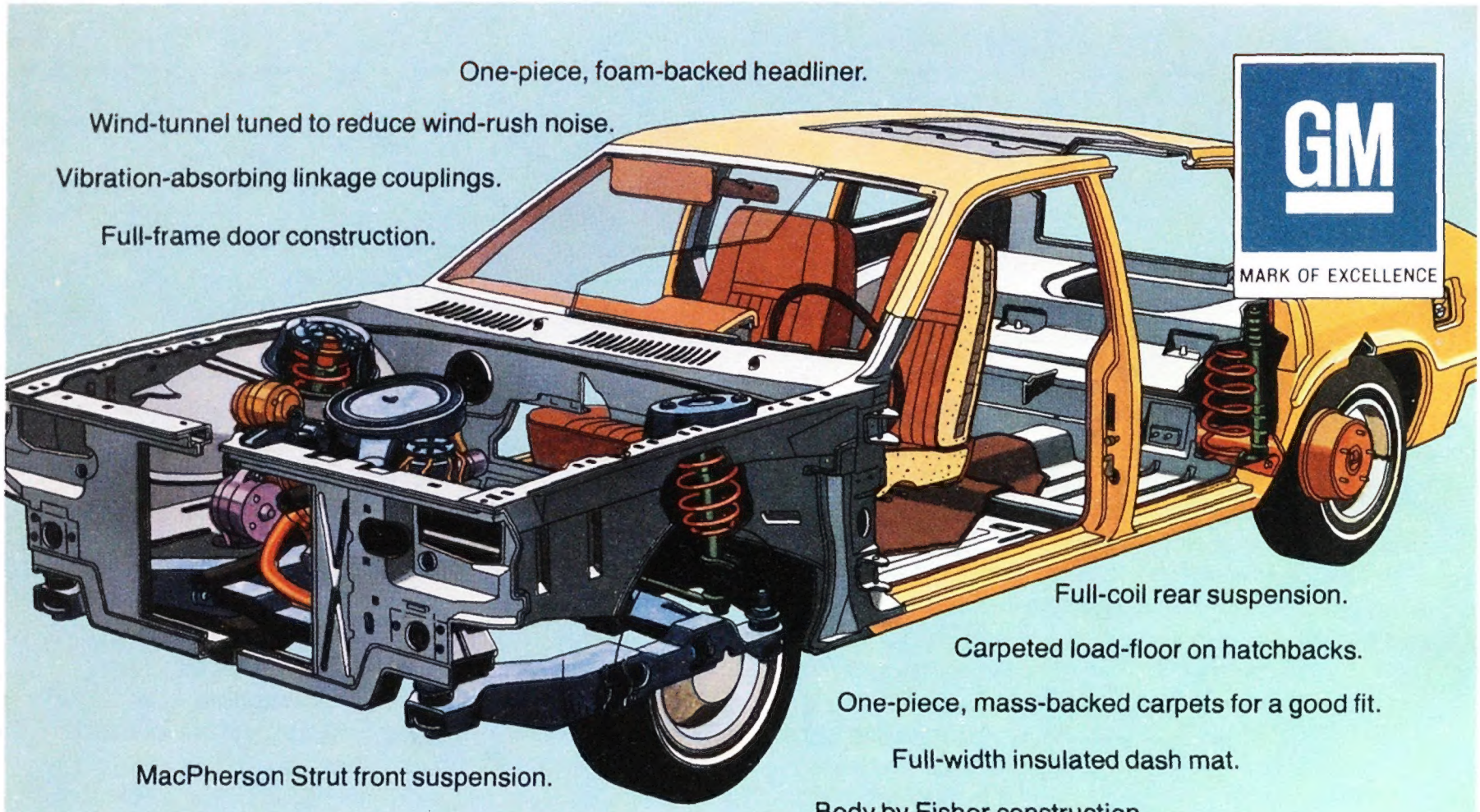
Be sure to try the Smith-Corona carbon film ribbon. We offer a re-usable nylon fabric ribbon, excellent for ordinary typing jobs. This is the only kind of ribbon most portable typewriters offer. But Smith-Corona also offers carbon film ribbon in five colors. It's the kind of ribbon the most expensive office typewriters use, and it's perfect for jobs requiring a crisp, professional look such as term papers or a resume.

More people prefer Smith-Corona electric portables than all other brands combined. After these tests, we think you'll know why.

Patented Correction Cartridge

SCM® SMITH-CORONA
SCM CORPORATION

GM's New Front-Wheel-Drive Cars Engineered for quiet. And with a solid, comfortable feel.



From the day the new Chevrolet Citation, Pontiac Phoenix, Oldsmobile Omega and Buick Skylark first started taking shape on the drawing board, a prime design objective has been to please the ear as much as the eye.

Noise control through isolation. One of the ways we went about this was an all-out effort to isolate the passenger compartment from the engine, suspension and other chassis hardware.

Body and engine mounts are specifically tuned to dampen or eliminate vibration frequencies that might prove annoying inside.

There are vibration-absorbing couplings between mechanical components running from the engine compartment to the passenger compartment—transmission linkage, acceleration pedal linkage, you name it. Even the MacPherson Strut front suspension and full-coil rear suspension have special cushioning devices that let you get a firm feel of the road without harshness of ride.

Noise fighters.

But isolation is just one form of controlling noise. To help cut down on wind-rush noise, these cars were extensively tested in the wind tunnel. All models feature Body by Fisher construction with fully framed doors and new door seals to help keep noise out. Hatchback models have auxiliary seals in back. There are one-piece, mass-backed carpets and foam-backed headliners. And special acoustical-insulation packages are available on certain models.

If "quiet" engineering and a good ride are important in your selection of a car, we'd like to recommend that you test-drive these.

You're in for a thoroughly delightful experience.

GM's Front-Runners for the '80s.

Look into buying or leasing at your GM dealers today.

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Smithsonian

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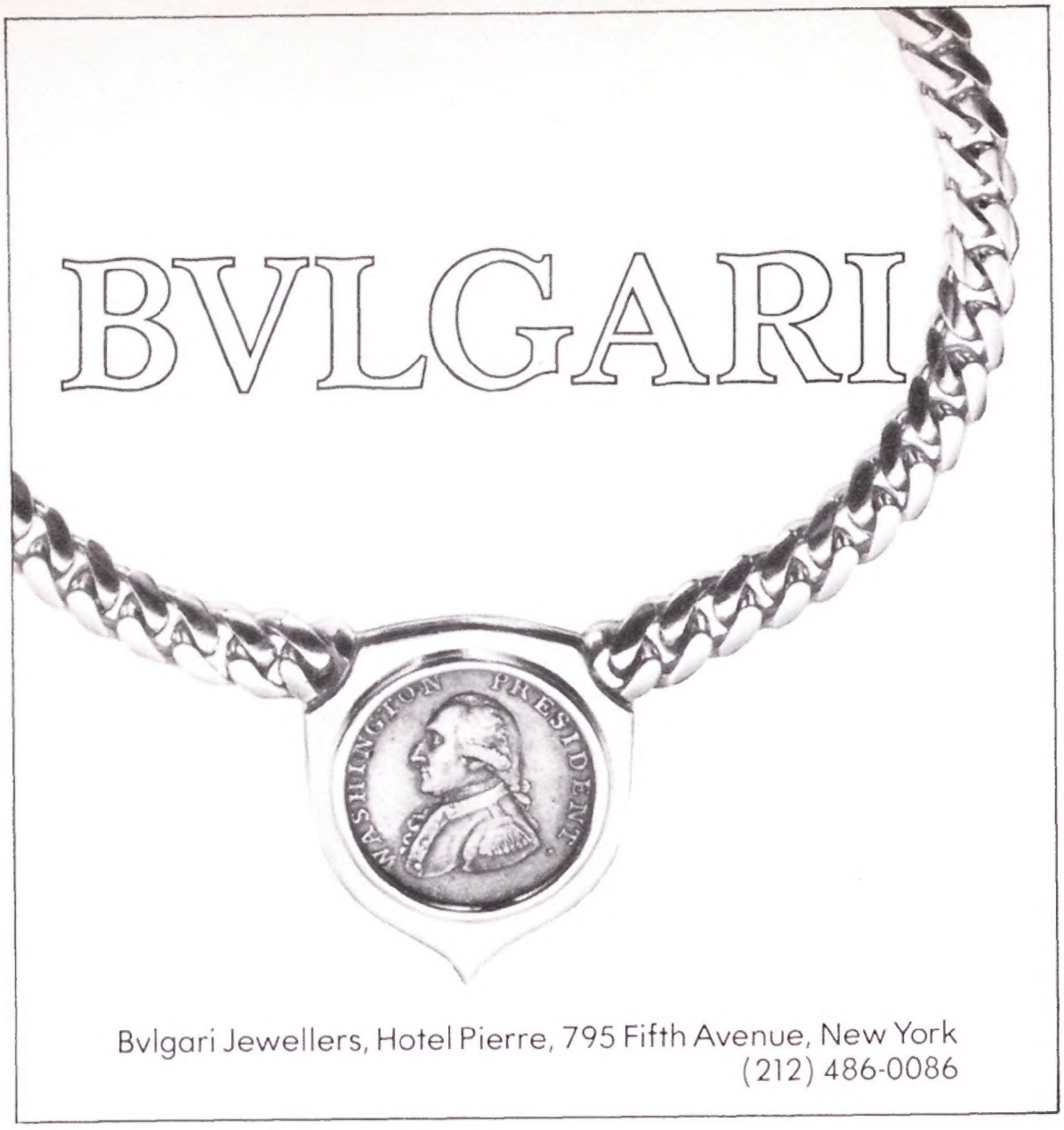

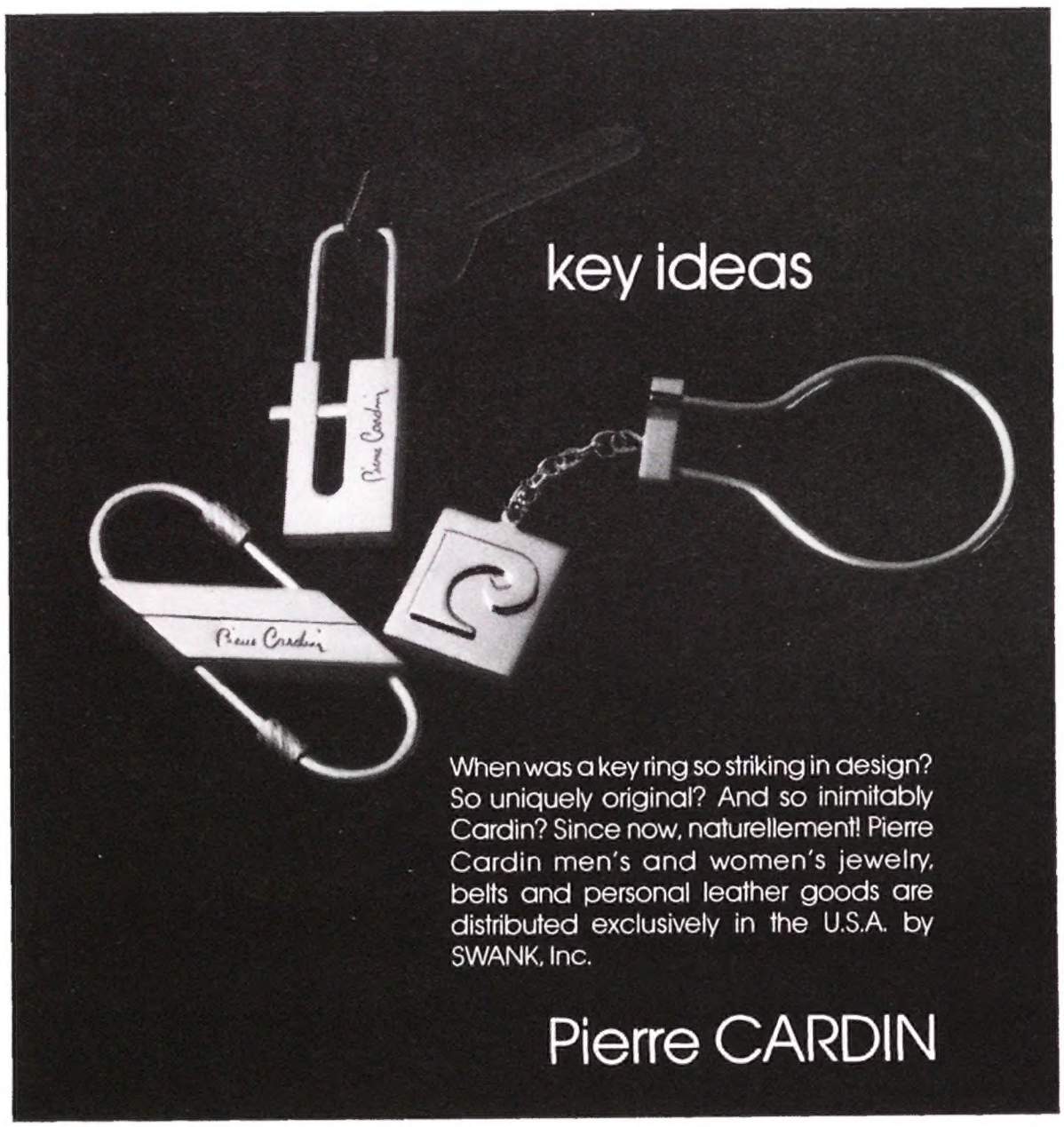
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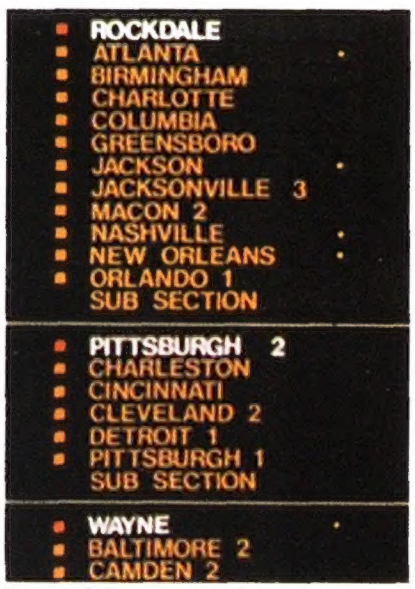
HOW THE BELL SYSTEM OVERSEES 40 MILLION LONG DISTANCE CALLS A DAY.

ON AN EASY DAY.

The Network Operations Center, Bedminster, New Jersey.



Part of the network status board, where NOC personnel watch for possible jam-ups.

You are looking at the Bell System's Network Operations Center. Here, our technology and people work 24 hours a day to help your long distance calls go through quickly, effortlessly.

When you make a long distance call, it has several different routes it can take, automatically.

But sometimes traffic gets particularly heavy. We can get a bottleneck.

That's when the people of the Network Operations Center move in. Using the most advanced Bell System computer technology, they re-route the traffic to get your call through.

In round numbers, the Network Operations Center helps manage nearly 40 million calls, on a normal day. At busy times on busy days, the volume surges even higher.

So come Christmas or Mother's Day, hurricane or high water, virtually every long distance call you make goes through quickly and easily.

Thanks to all the people of the Bell System.

No matter when you make your long distance call, the NOC stands ready to help it get through without a hitch.

Bell System

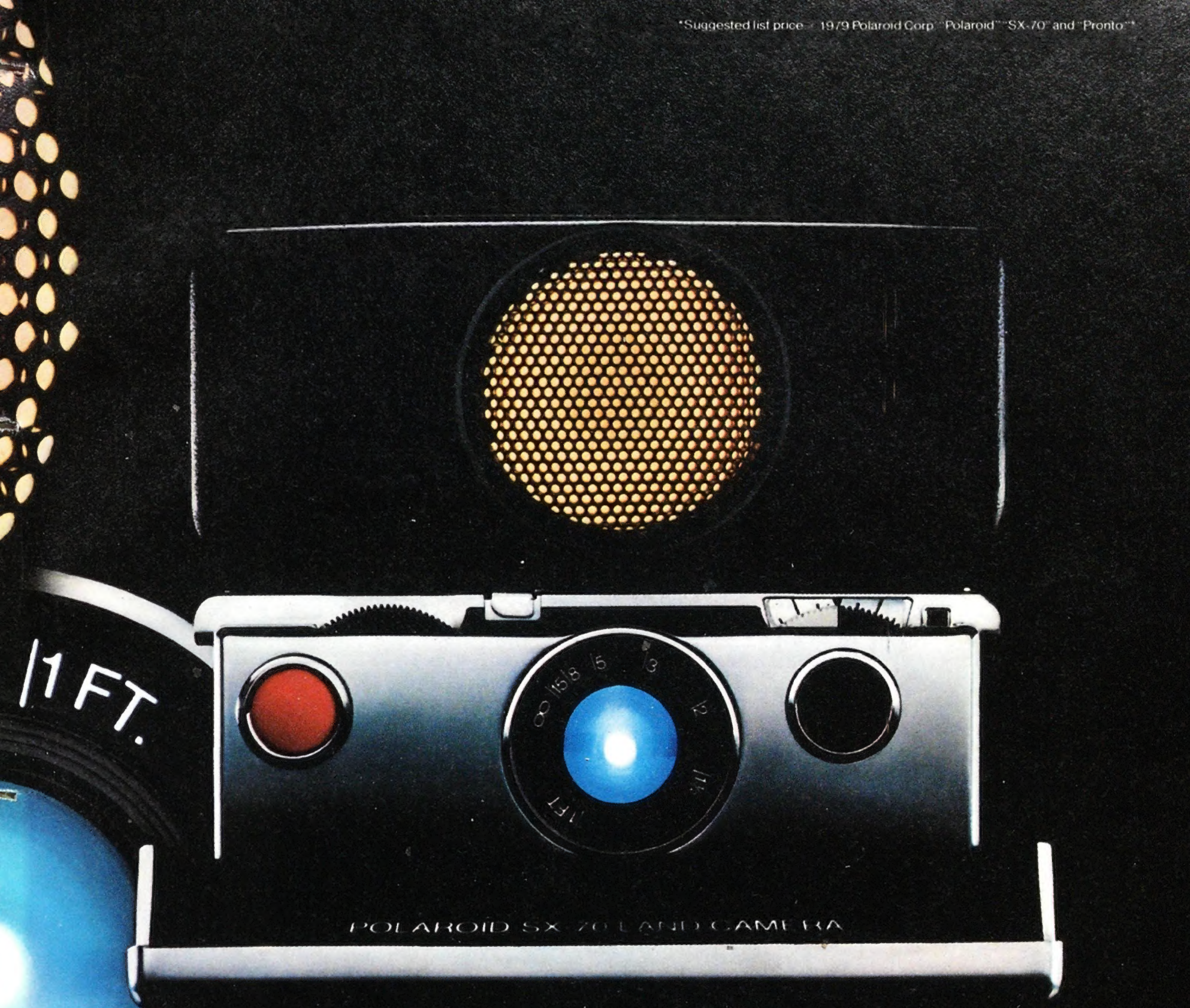
Keeping your communications system the best in the world.

Now you can get sharp, precisely-focused pictures every time—with Polaroid's SX-70 Sonar OneStep®, the world's finest instant camera.

Just press the red button. Inaudible sound waves dart from the transducer to your subject and back, measuring the exact distance—even in total darkness. And the 4-element glass lens automatically rotates to the precise focus—from as close as 10.4 inches to infinity. All within a split second.

In fact, sonar can change focus so fast, now you can get those candid, unposed shots you might have missed before. With sonar automatic focusing, you can shoot 10 pictures, one right after another, in just 15 seconds.

*Suggested list price. © 1979 Polaroid Corp. "Polaroid" "SX-70" and "Pronto" *

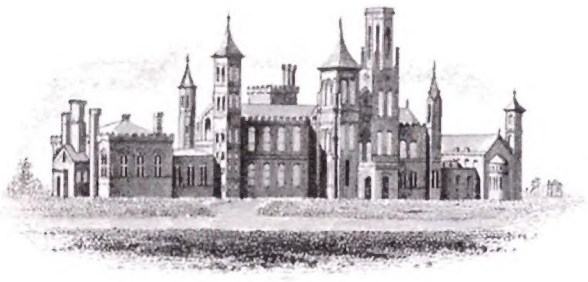


The SX-70 Sonar OneStep controls all exposures automatically, too. It offers a unique combination of variable apertures (f/8 to f/74) and shutter speeds (1/125 to 14 seconds)—all computed at the touch of one button. You can take automatic time exposures up to 14 seconds. And flash pictures up to 20 feet. The built-in motor even hands you the developing picture—one-and-a-half seconds after you press the button.

There are two Polaroid Sonar Land cameras: the folding single-lens reflex SX-70 Sonar, described here, and the less-expensive Pronto Sonar, at $99.95*. No other cameras make precision photography so simple.

Secretary Ripley's comments

The view from the castle



New to science, a large, dark, mysterious population of white-fronted geese acquires a name—that of a fellow lover of birds

The small geese species tend to be more colorful than the larger ones. But some of the large geese are very graceful and full of their own distinction and beauty. Such a species is the white-fronted goose—slender, with a slim neck, a lovely pink bill and pinkish-orange legs. The whitefront derives its name from the white feathers on the adult's face and forehead just back of the bill. This white area has a narrow black edging, just forward of the lustrous eye, which itself is outlined by a very narrow, fleshy, yellow eye-ring. Thus the face and head of the whitefront is highly distinctive, and—carried so erect and looking so alert—gives the species great individuality.

Although white-fronted geese seem common enough in parts of the North American continent, there is actually more than one kind of the species. The vast majority of the 400,000 birds estimated to occur in our country and Canada belong to a so-called tundra subspecies, *Anser albifrons frontalis,* a moderate-sized brown goose with the pinkish bill, white face and bright legs described above. (In addition, there are darker white fronts that breed in the woody scrub growth of the taiga just south of the tundra. Most of these birds, called *gambeli,* winter east of the main mountain ranges in western North America.)

But there is an enigmatic "mystery" population, an even larger and darker blackish-brown bird, that winters on some 10,000 acres in the Sacramento region. These birds feed on rush roots and pond weeds, eating the submerged tubers with their coarse, serrated bills.

The common whitefront, *frontalis,* roosts on the water but feeds on land, grazing on cutover rice fields or out in the drier marshes. These birds flock together, sometimes by the thousands in the Sacramento area.

Our big, darker friends, on the other hand, have distinctive solitary habits, keeping to small groups of no more than seven or eight individuals at the most. All whitefronts have a laughing, yelping two-syllable call, quite musical; but the big birds fly up with a slower wingbeat, showing their blackish backs, and their call is gruffer, a deeper, more sonorous "yelp."

This dark bird, sometimes called the tule goose because of its habit of staying near small, rush-bordered ponds, is mysterious because no one has yet determined where it nests in spring. There are an estimated 1,500 of these big whitefronts.

Through the kindness of the Fish and Wildlife authorities, as well as Bob Elgas—a Montana rancher and bird lover after whom my friend Jean Delacour and I have named these birds as new to science—we have a pair of them now on our ponds in Litchfield, Connecticut. The *Anser albifrons elgasi* walk about proud, noble, alert, keenly eyeing the other birds, keeping their distance. They seem to march to a different drum. Occasionally their bills will tilt up in unison as if they were looking to fly somewhere. But where? Their wings are clipped and they cannot tell us; would not, perhaps, if they could.

Our birds should nest this year. They are well mated, and content with our grass and reeds. If they do, as I expect, it will be a first for us. But if only they could tell us where their siblings have vanished to, far off in the Northwest!

S. Dillon Ripley

Fresh roses from Boehm.

Boehm makes porcelain sculptures of the world's most beautiful roses, including the Paradise Rose, one of the All-America Rose selection winners for 1979. A. Blue Moon Rose, limited edition, 5¾" high, 7" wide, 4½" deep. $525. B. Elegance Rose from the Spring 1979 Open Collection, 4¾" high 5½" wide. $250. C. Paradise Rose, from the Spring 1979 Open Collection, 5" wide, 4½" high, 5" deep. $275. D. Peace Rose, open collection, 8" long, 4½" wide. $175.

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See these graceful porcelains at these fine stores in your area:

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Ask your travel agent for the colorful, free Bonus Days brochure, with details on the offers and how easy it is to to qualify. Or write the Belgian National Tourist Office, Dept. C., 745 Fifth Ave., New York, N.Y. 10022.

BELGIUM'S BONUS DAYS

Belgium
Where Europe Begins

Letters to the Editor

Kathakali dancers

Dear Sir: EEK! That eyeball on the cover of your March issue! We had to keep the magazine turned over to get that huge red orb "gazing" anywhere but at us.

We are looking forward to a nice floral display—or some such—for the next issue.
Mrs. Joseph M. Walsh jr.
New York City
We hope you found the April gatefold cover, graced with Kordes' Iceberg roses, more pleasing to your eye. Ed.

Dear Sir: I read Madhur Jaffrey's excellent article on Kathakali dancers with mounting excitement, as I, too, am afflicted with a condition known in India as "Kathakali madness."

My daughter, Jan Zeitlin, studied this ancient art form in Kerala between 1975 and 1978, under the famed Padma Sri Kalamandalam Krishna Nair. She performed with him and the Tripunithura troupe of professional actor-dancers throughout Kerala. She was celebrated as the American girl who danced Poothana.

Since her return to the United States, she is teaching Indian dance here and giving performances in cultural centers—and hoping to return to Kerala.
Mrs. Harriet Zeitlin
Los Angeles

U.S. Geological Survey

Dear Sir: P. F. Kluge's fine article on the U.S. Geological Survey was of special interest to us because our father, George Stanley Druhot, was associated with the topographic branch of the Survey for 39 years. He began as a rodman in 1914,

For Father's Day. The 3rd Annual Johnnie Walker Black Label Scholarship Contest.

It's estimated that $40,000 will pay for that hat. And that's our first prize: A $40,000 college education. Second prize is a $4,000 scholarship. There are eleven third prizes of $1,000 scholarships. Any prize can be taken in cash. Just use the coupon here or get an entry blank at any participating restaurant or merchant. Maybe you'll win a hat you can give to someone with a head on his shoulders.

Official Rules 1. To enter, fill in the official entry form—clearly hand printing your name, address and the answers requested in all three statements (or, on a 5" x 8" plain piece of paper clearly hand-print your name, address and answers requested in the three statements on the official entry form). The answers to these statements may be found by looking at the labels on any bottle of Johnnie Walker Black Label Scotch Whisky. Labels may be obtained by requesting some from Labels, P.O. Box 900, Pound Ridge, N.Y. 10576. **2.** Enter as often as you wish, but each entry must be mailed in a separate envelope no larger than 4-1/8" x 9-1/2". Mail to: Johnnie Walker Black Label Contest, P.O. Box 7075, New Canaan, Conn. 06842. Entries must be postmarked by June 25, 1979, and received by June 30, 1979. **3.** Winners will be determined in random drawings from among all correctly answered and eligible entries conducted by V.I.P. Service, Inc., an independent judging organization whose decisions are final, and will be notified by mail. **4. First Prize:** The cost of a four-year college education for the winner's child or anyone the winner chooses, up to a limit of $40,000, or $40,000 in cash to be paid in one sum, or $2,500 quarterly per year over a period of four years. Payments will begin November 1, 1979. **Second Prize:** $4,000 in cash to be used (if so elected by the winner) toward the cost of a college education for the winner's child or anyone the winner chooses. **11 Third Prizes:** $1,000 in cash to be used (if so elected by the winner), toward the cost of a college education for the winner's child or anyone the winner chooses. The awarding of prizes to prize winners will be subject to the execution of an affidavit of eligibility and release granting to Somerset Importers, Ltd. the right to use winners' names and photos in its publicity. **5.** Prizes are non-transferable; only one prize to a family and no substitution for prizes except as stated. The odds of winning will be determined by the number of correctly answered entries received. All 13 prizes (valued at $55,000) will be awarded. Local, state and federal taxes, if any, are the responsibility of winners. **6.** Contest open to residents of the United States. Employees and their families of Somerset Importers, Ltd., their advertising agencies, liquor wholesalers and retailers, and V.I.P. Service, Inc. are not eligible. Contest void in Ohio, Pennsylvania, Texas, Utah, Virginia, and wherever prohibited or restricted by law. All federal, state and local laws and regulations apply. **7.** ENTRANTS MUST BE OF LEGAL DRINKING AGE UNDER THE LAWS OF THEIR HOME STATE AS OF MAY 1, 1979. **8.** A list of winners will be furnished, two months after the close of the contest, to anyone who sends a stamped self-addressed envelope to: Johnnie Walker Black Label Winners List, P.O. Box 600, Pound Ridge, N.Y. 10576. Please do not send entries to this box number. **9.** The Official Entry form may not be reproduced. NO PURCHASE REQUIRED.

Johnnie Walker Black Label Scotch 12 YEARS OLD

Blended Scotch Whisky. 86.8 Proof. Imported by Somerset Importers, Ltd., N.Y.

OFFICIAL ENTRY FORM

To enter, look at the labels on any bottle of Johnnie Walker Black Label Scotch and indicate the correct answers requested below.

1. Johnnie Walker Black Label is bottled in (answer) _____ Scotland

2. Johnnie Walker Black Label is blended and bottled by (circle correct answer)
John Walker and Bros., John Walker, Inc., John Walker and Sons, Ltd.

3. The name Walker appears (answer) _____ times on the 3 front labels.

Mail your completed entry form to:
JOHNNIE WALKER BLACK LABEL SCHOLARSHIP CONTEST
P.O. Box 7075, New Canaan, Connecticut 06842

I certify that I am of legal drinking age under the laws of my home state as of May 1, 1979.

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

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Be good to yourself, take the train.

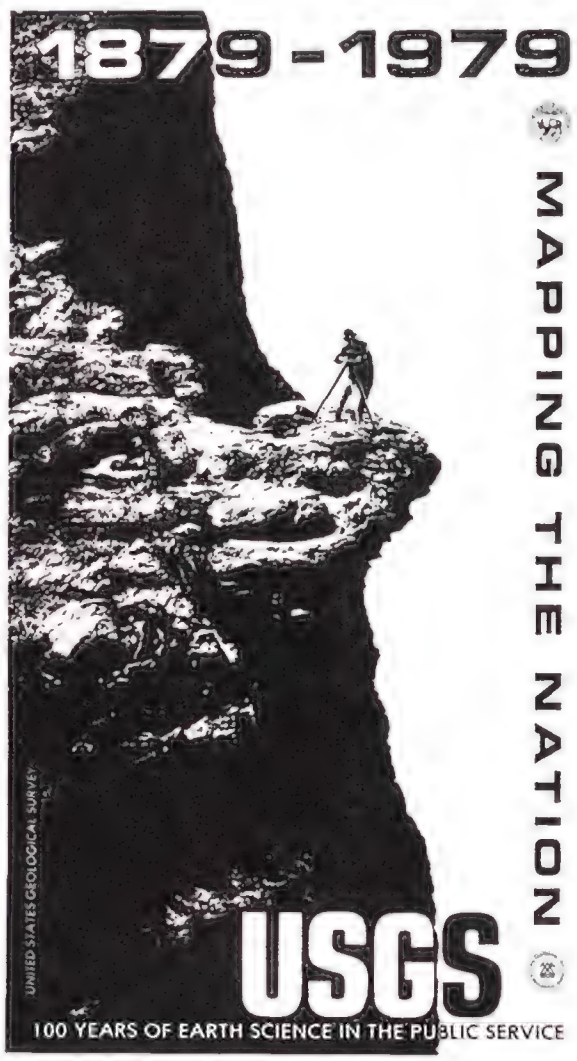
VIA

doing horse-and-buggy traverse on some of his first assignments. He was one of the earliest topographers to use photographs taken from airplanes in the mapping process—this in the Hawaiian Islands in the late 1920s. During his career, he participated in mapping in 22 states.

He now divides his time between California, Missouri and Ohio and does some occasional surveying in those states—in his 84th year.

The poster prepared in observance of the 100th anniversary of the founding of the Survey features a silhouette of our father [see below] based on a photograph taken in Hawaii in 1928. He is shown with plane table and alidade on Kahekili Leap west of Oahu's Makapu Point.

Mrs. Myra Hester and *Mrs. Phyllis Levers*
Menlo Park, California



Dear Sir: Your article on the USGS' 100th anniversary was slightly tainted by a malicious quotation. As a former USGS employee, I can understand the "esprit de corps" of the youthful Survey staff member, who states that some other government people work only one day out of five. A self-serving statement that demeans others is counterproductive and does not enhance the USGS work-ethic

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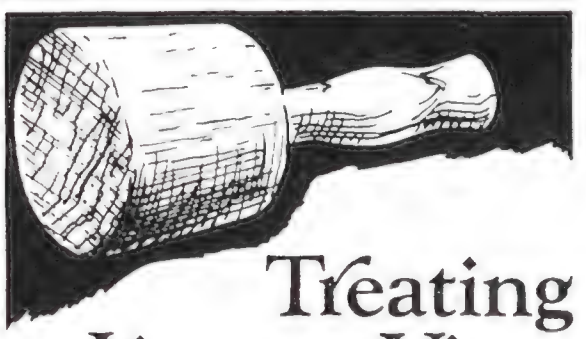

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credibility. Fortunately, he has the time to acquire wisdom with maturity.
Nate Fishel
Alexandria, Virginia

Cities

Dear Sir: In the article, "How to get on top as a city . . .," the comments on Seattle had a particularly intriguing statement: "Once apparently doomed by a highway program, this waterfront end of the famed Yesler Way skid road was instead reclaimed and refurbished."

Skid road must be the West Coast version of what New Yorkers call skid row.
John K. Grant
New York City
In the 1850s Yesler Way was known as skid road because it was the steep incline down which Yesler's Mill shunted logs. But, in time, skid road generally became a familiar tag for logging roads populated with saloons and brothels. For today's refurbished Yesler Way, see below. Ed.

Dear Sir: In the cities article, I was shocked by Richard L. Williams' slur at San Francisco's gay community. Since they do make up one-fifth of the electorate, it does not seem unreasonable to

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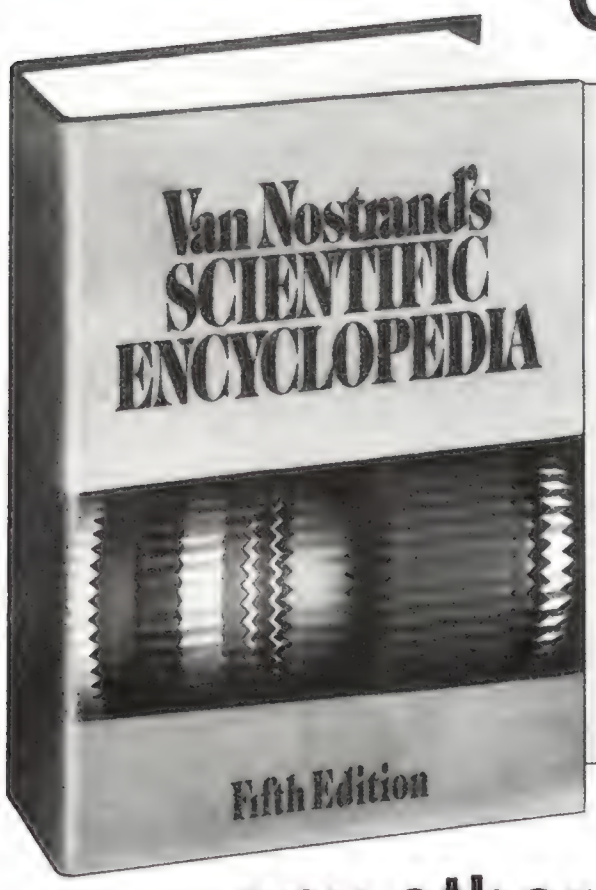

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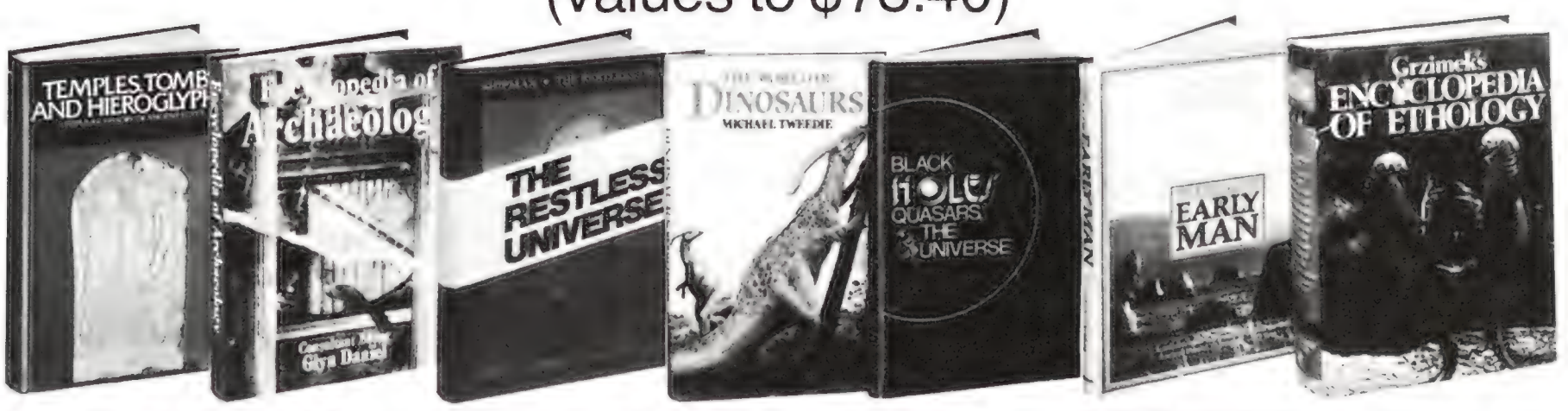

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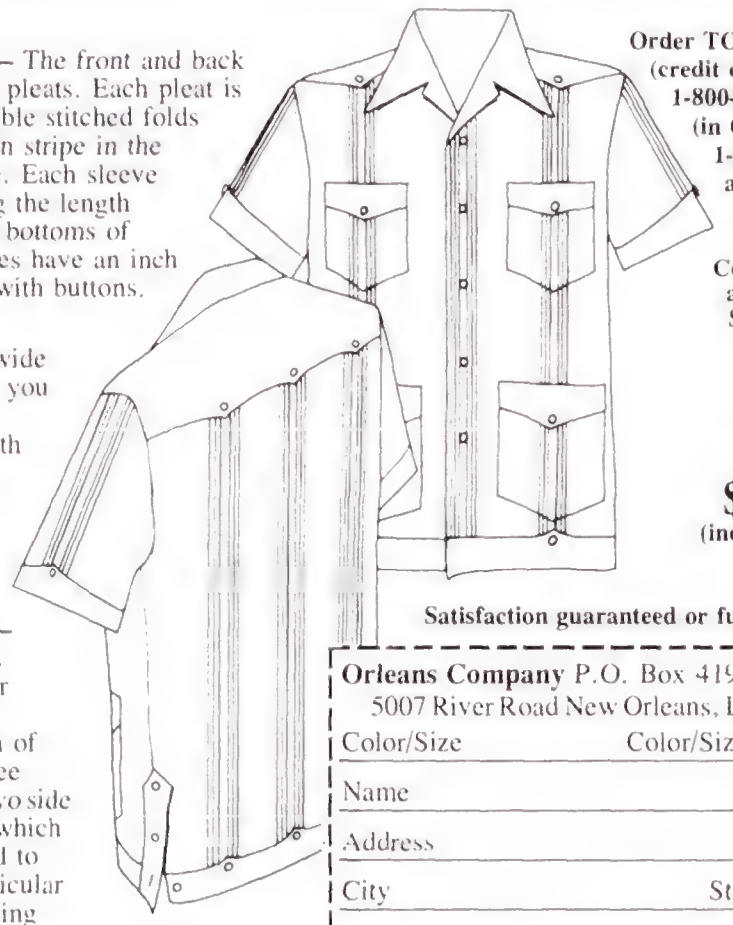

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suppose that a fair share of the "muscle" and "style" with which San Francisco operates can be credited to its gay citizens. This particular city has shown a spirit of generosity and tolerance which attracts many diverse types of people and encourages them to contribute their best. That kind of warmth and openness says more to me about the long-range future of San Francisco than your aspersions do.
William R. Coe
Grosse Pointe, Michigan

Dear Sir: I enjoyed your cities series, especially the one in January mentioning Baltimore as being among the cities still "showing signs of fight." Having this good word appear in your magazine means that news about our city's efforts will quickly spread nationwide.

You ended on Jim Rouse's prediction: "By the year 2000 the obsolete part of America will not be cities, but suburbs. You'll see." Maybe you'll want to follow up and check on our progress!
William Donald Schaefer, Mayor
Baltimore

Rodeos

Dear Sir: In regard to Paul O'Neil's article on rodeos, we would like to state categorically that The Humane Society of the United States is of the firm opinion that no rodeo can be staged without pain to the participating animals. No consideration was given in the article to the suffering involved and how animals are forced to perform as they do.

Take calves used in roping contests, for example. When the door of the chute is opened, the calf breaks out across the arena at full gallop with the roper pursuing. But the calf doesn't leap into a gallop because it wants to entertain the crowd. The calf runs desperately because just as the chute door opens a man behind the animal jabs it with a sharp-pointed prod, or jolts it with an electric shock at one of the most tender parts of the body, or twists its tail violently. Then the frightened animal is roped, a noose thrown around its neck while at full gallop. Very often the calf is thrown head over heels, slammed to the arena floor (rodeo people say that the calf is "busted"). A contestant is penalized time if the calf is busted, but it happens quite frequently because it is unavoidable.

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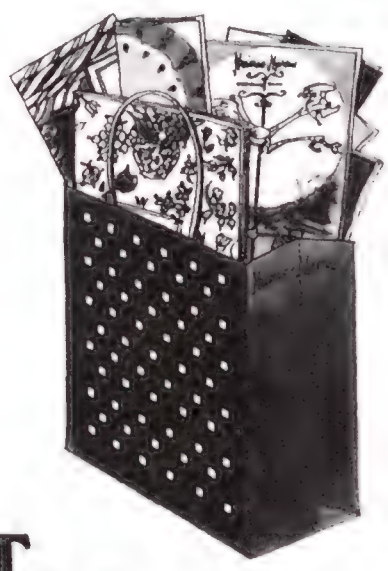

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events, straps are cinched tightly around horses in order to torment them and make them buck.

And let's face it, the animals are not there by choice; the performers are.

John A. Hoyt, President
Humane Society of the United States
Washington, D.C.

Dear Sir: The saddest part of the picture is the unconscionable promotion among children and youths—a promotion to guarantee a future for rodeo's entrepreneurial gold mine.

Captain J. Stanley Nants jr., USNR
Hillsdale, New Jersey

Dear Sir: I believe the man responsible for the beginning of the junior rodeo in the United States has not been given the credit he deserves. The first junior rodeo was held here in Florence, Arizona, in 1932, and Charles A. Whitlow sr. was the moving force behind this event from its inception until his death in 1970.

Mrs. John W. Huffman
Florence, Arizona

Blacks loyal to the Confederacy

Dear Sir: In J. K. Obatala's article, "The unlikely story of blacks who were loyal to Dixie," I take exception to the author's claim that "grape was not used in field pieces during the Civil War." I have in my collection, for example, grape recovered from the field at Gettysburg.

From the records of "Ordnance and stores, U.S. Army 1861-1865" (compiled by Colonel Berkeley R. Lewis, Ordnance Corps, U.S. Army, Retired) comes the figure of amounts purchased—6,539,999 pounds of grape and canister shot at a cost of $314,559.

Fletcher Johnson
Indianapolis

Edwin C. Bearss, Supervisory Historian for the National Park Service, states that grape was rarely used in field pieces during the Civil War, but it was used extensively in naval weapons and in heavy artillery such as siege guns. Ed.

Dear Sir: Thank you for the wonderful illustrations by Arthur Shilstone, accompanying the story of blacks who were loyal to Dixie. As an art student, I find them refreshing and inspiring.

Betty C. Tyner
Bradley Beach, New Jersey

Elvira

3

I began this series with some historical facts on how my family came to be winemakers and how our wines benefit from this heritage. I want to give due credit, also, to my grandmother Elvira - not a winemaker but a winemaker's wife.

In 1904, 16 year old Elvira Eraldi became Mrs. Samuele Sebastiani. That same year Samuele founded his long-dreamed-of winery in Sonoma and they began building our family business. While Samuele made his wine Elvira raised chickens and took in washing. She spent long hours over a scrub board to help meet expenses. Eventually, with her support, the winery grew and prospered. Samuele called her his Lady of the Vineyards.

She became an accomplished cook, laboriously making her own pastas and cheeses. Many enjoyed her culinary talents, among them, A.P. Gianini, founder of Bank of America and close friend of Samuele.

Unique was Elvira's love of birds. She raised song birds for years and stirred a similar interest in her son, August, my father, who has raised and bred rare game birds for over half a century.

I could go on but it's enough to say Elvira Sebastiani was an inspiration to her husband and to all of us who have followed.

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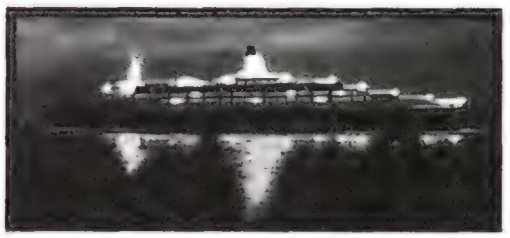

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Phenomena, comment and notes

Help for jogging junkies, seven rules for avoiding death on the highway and a tax system that soaks the risks

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Never mind the tickle; the intelligent person moves as little as possible in May. Why bother, after all? Where could things be more delightful? Further, motion is dangerous.

Moving as little as possible, one samples the literature of science and medicine, discovering as one turns the pages with determined languidness just how risky things are. These seekers of truth seem preoccupied with danger.

A physicist named Richard Wilson from Harvard seems to be the most nervous of the lot—and I suppose if I were a physicist I'd be nervous, too. Imagine making a career out of establishing rules about the invisible. In any event, poor Dr. Wilson writes in *Technology Review* (Vol. 81, No. 4) about all of the risks he faces from dawn to bedtime every single day of his life. For example, his first act of the day, turning on the light, reminds him of the old wiring in his house and

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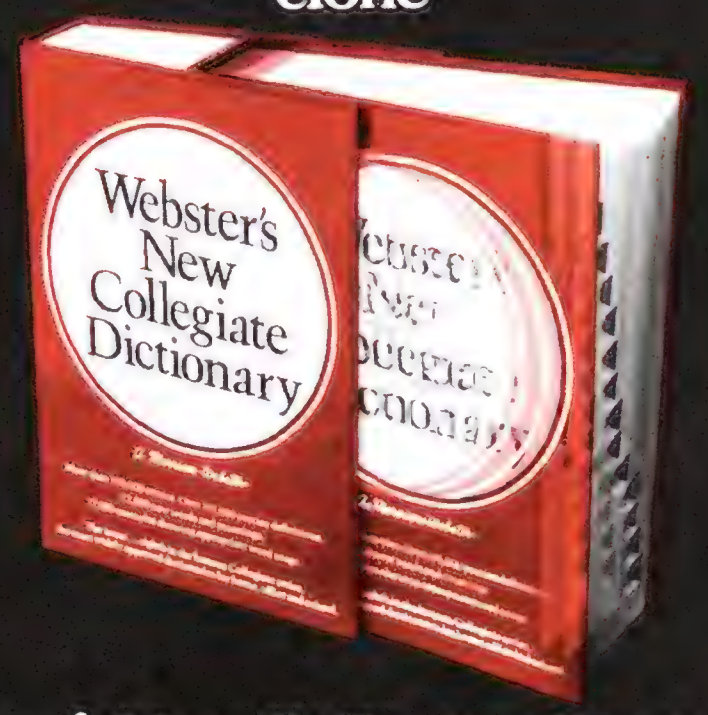

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that 500 people die each year in this country from accidental electrocution. His last act of the day, getting into bed, gives him pause over the relative risks of dying by fire (since his pajamas are flammable) as opposed to the risk of cancer if he wears pajamas treated with TRIS.

Dr. Wilson is not the sort of person merely to worry about risks. Nor is he suggesting that anyone dream that they can all be eliminated by draconian social engineering. His scheme is to *quantify* the risks we all face and let us decide. He *does* suggest that people who impose risks on society should be taxed; taking an arbitrary figure of $1 million as the value of a human life, he says one might tax the risk-producer one dollar for raising the chances of a person's death by one in a million. This would be very hard on cigarette makers and consumers (a 70-cent tax on each cigarette), but he doesn't say what it would cost the old apple tree that entices children into its branches from which they fall at least once during childhood.

Here then are some of Dr. Wilson's candidates for activities that should somehow be taxed one dollar, since each increases the chances of death by one in a million: smoking 1.4 cigarettes; drinking a half-liter of wine; spending one hour in a coal mine, two days in New York City, six minutes in a canoe, ten miles on a bicycle, 300 miles in a car, 1,000 miles in a jet plane, or two months in a brick building (they give off radiation); one chest x ray; eating 40 tablespoons of peanut butter; drinking Miami's water for one year; or eating 100 charcoal-broiled steaks.

One could no doubt fuss with Dr. Wilson's figures. Indeed one could even get out a calculator and work out the complex calculus of jet travel, steaks, wine and canoeing one might allow oneself, but it seems not worth the effort. Who knows what risks lie in the miniaturized innards of a pocket computer?

Better to lie back in a hammock and look further into the literature, making sure not to lick one's fingers lest there be lead in the printer's ink.

Highway strategy

All right, if you drive 300 million miles you are statistically dead, by Dr. Wilson's standards. There have been more than three times as many highway fatalities

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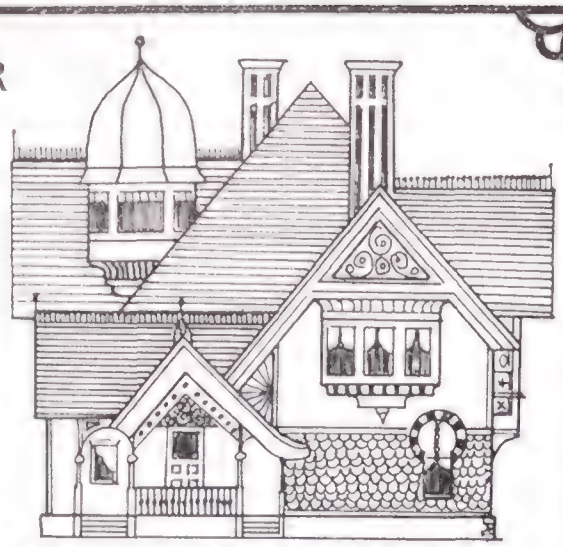

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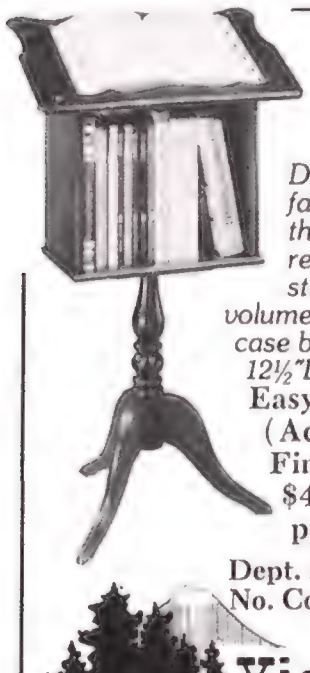

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in America as war deaths, suggesting that the Pentagon would pay less of Dr. Wilson's proposed taxes than Detroit. But how do you beat those highway odds, since—being American—you will certainly drive many miles lest you be thought antagonistic to the American way of life?

A series of suggestions arises in *Environment* (Vol. 21, No. 1): 1. Move away from thinly populated states in the West like Montana, Wyoming and New Mexico, and take your family to Rhode Island, New Jersey or Connecticut. High population density makes for safer driving, it seems. 2. Become a woman if you are not one already. Failing that, be a middle-aged, not a young, man. 3. Drive on turnpikes. 4. Drive in a city. (Driving only on turnpikes in cities will presumably limit what can be accomplished by driving at all, which will certainly discourage everyone except teen-aged dragsters, thus helping the entire situation.) 5. Neither drink nor fail to put on your seat belts. 6. Drive not at night. 7. With apologies to the Secretary of Energy, drive a large car. They're twice as safe, statistically, as a small one.

If followed, these rules would bring your lifetime risk of highway death down to one in 100, from the present 1.5 in 100 overall or three in 100 for suburbanites. If you really want to be safe, ride a bus, but that is un-American.

Good medical news

With society constantly adding to the risks of being alive, one wonders if there is not room for a new publication similar to the *Racing Form* in which Dr. Wilson and like-minded colleagues would give the daily odds on each new product and activity, giving rise ultimately to a whole new profession—the health and longevity tout. ("Psst! Hey, buddy, I got a line on a new brand of peanut butter. Made in Venezuela. Moves the one-to-a-million risk limit up to 100 tablespoons.")

Any handicapping device would have to include the latest from the old-fashioned world of medicine in addition to the opinings of the physicists and the health-food gurus.

And this month there would be encouraging news. While coronary heart disease remains the principal grim reaper in American life, cardiovascular mortality rates have declined more than 30 percent during the last three decades. Stroke,

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third most common cause of death, is also on the decline. While it has declined in all sex-age-color categories and all regions, the greatest decline is among nonwhites; so great is the decline among nonwhite females 35 to 74 years old that *The New England Journal of Medicine* (Vol. 300, No. 9) calls it "a fundamental change in the pattern of the disease."

Just why these two specters have become less dangerous statistically, the medical profession doesn't know. Is it better patient care, reducing fatalities of the afflicted or a lower incidence of attacks? Is it preventive medicine? Environmental changes? In stroke, is it better treatment of hypertension? "For a change," says the *Journal,* "we find ourselves with some good health news. Let's both enjoy it and find out why." To which the innocent layman can say only, supplicatingly, "Please do." One should be nice to doctors. Often they know not, like the rest of us, what they've done.

Mixed medical news

Health handicappers must, of course, recognize that ultimately the odds are against. It may be that one can avoid a one-in-a-million chance of heading off into the great beyond by swearing off charcoal-broiled steaks, but something, someday, is going to get each one of us.

One has the feeling that this ultimately very liberating statistic is overlooked by a number of people—a growing number —who have the childlike notion that they can find the fountain of youth by spending a vast portion of their day keeping what is called "fit." The "in" way of doing this is to run here and there.

So great is this fad that the medical profession has had to stir itself and respond. Sports medicine is now a booming field where once it was pretty much limited to a few doctors who took care of those athletes who are at least paid (by check or by scholarship) to bash their bodies into oblivion. Now, thousands of patients stop sweatily by their doctors' offices with shin splints, tendon problems, foot problems, sprained ankles and what not.

If the doctor is an orthopedist, the patient is likely to be told to stop running for a few weeks until the condition heals, advice it would hardly seem necessary to bother a professional for, particularly at the going rates for such professional wisdom. But it turns out, according to

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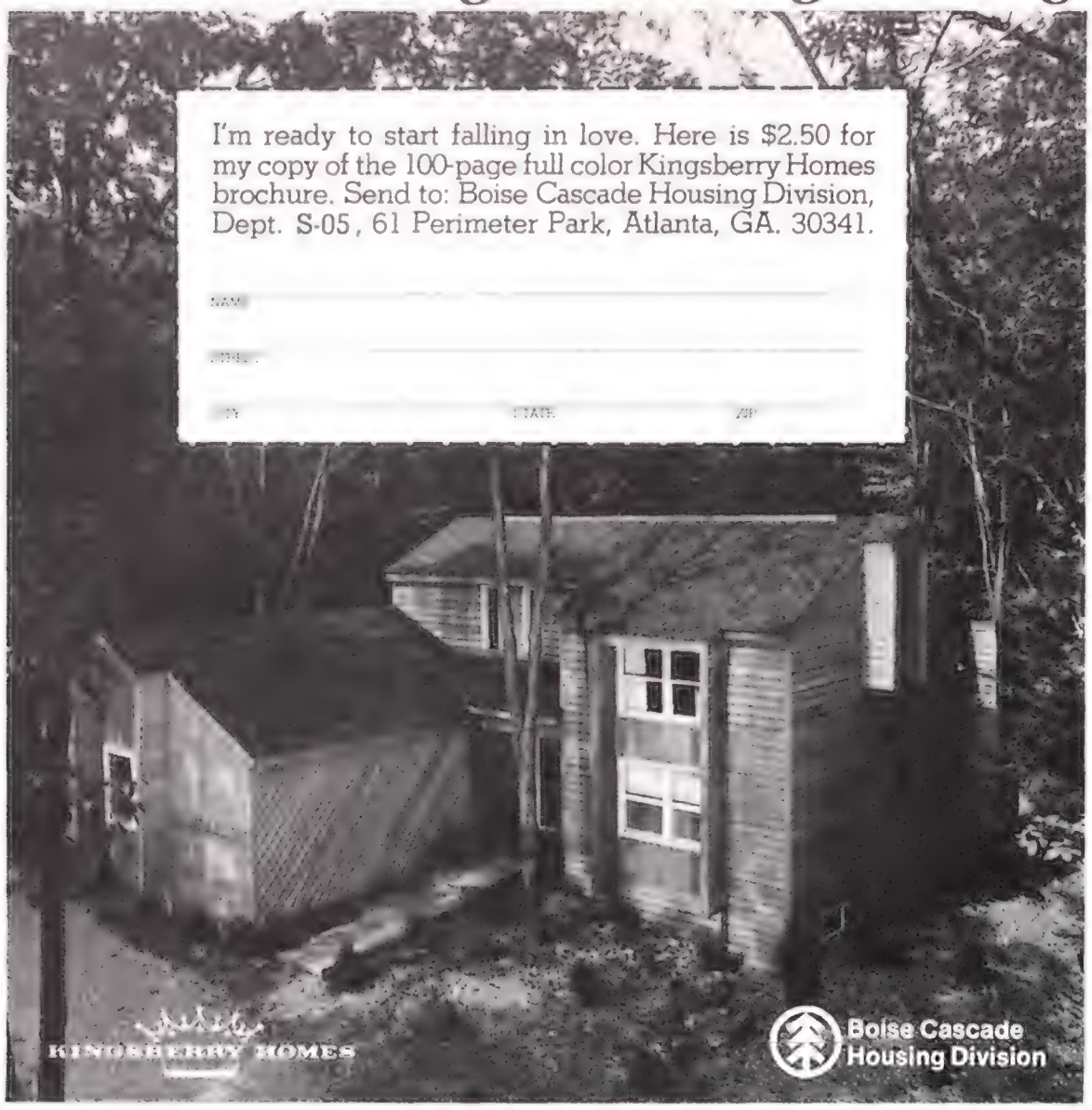
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Medical World News (Vol. 19, No. 24) that runners don't want to hear that advice. Runners tend to hate orthopedists. Runners, you see, become addicts: a doctor who is a vice president of the American College of Sports Medicine told how he injured his back skiing and had to stop running (one wonders when he had time for medicine): "The pangs of withdrawal were horrible . . . I couldn't eat, I couldn't sleep. I couldn't work."

What does the injured jogging junkie do if his orthopedist threatens him with the pangs of withdrawal? He goes to a podiatrist. It seems that this medical specialty has a whole new lease on life—away from the nether world of corns and bunions into the more prosthetic arena of keeping runners running in spite of injuries, keeping the addict on the stuff.

This seems a remarkable shift in medical philosophy, one not available to smokers or overeaters. Is this because the medical profession is certain that running in aimless circles is in fact good for you, even if you have a lax anterior cruciate ligament or shin splints? The question is more fraught with controversy and bickering than politics has been since Harry Truman. Suffice it to say that there is "only 'highly suggestive' evidence that regular endurance exercise may reduce morbidity and mortality from cardiovascular disease."

Being a bit lax in the anterior cruciate department (and it being May), I think I will keep my eye on this developing phenomenon from the vantage point of my hammock. In due course I suppose the odds makers will be able to assert positively that stumbling along the local roads in the wake of automobile exhaust pipes is unquestionably beneficial to my chances of living forever. By then it will no doubt have turned cold and I will run—inside, to the sofa.

—JAMES K. PAGE JR.

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Around the Mall and beyond

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Probably the first thing you see is a stone ring mounted on a pedestal. It's an example of the famous Yap stone money from the Western Pacific. It's not the largest of these stone rings from the islands. Dr. and Mrs. Clain-Stefanelli, who supervise our Smithsonian numismatics, described rings as thick as a tree and twice the height of a man. I asked the usual touristy question about how in the world a shopper could carry such a thing down to the old Yap Safeway, and I received the patient reply that the huge rings just stayed at your house to indicate your wealth. They were quarried in the Palau Islands and rafted hundreds of miles to Yap and then piled against your house to give you status. Like having a Rolls parked in your drive—but without gas.

The Clain-Stefanellis are precise and dedicated scholars who wince politely at any hoopla about huge money, tiny money (which we also have), medium-sized money (well, look at the picture), exotic money (we have that, too), checks drawn for vast amounts of money (that, too), a check made out of steel, canceled with machine-gun bullets (not on display since it's *much* too hooplaish).

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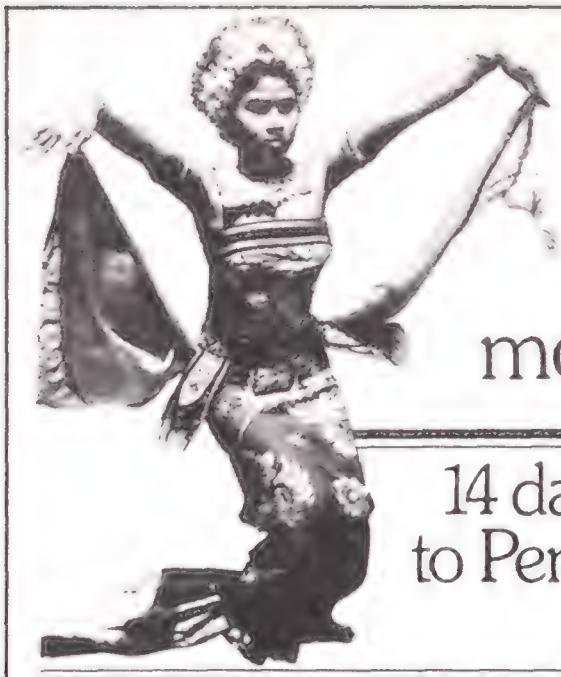

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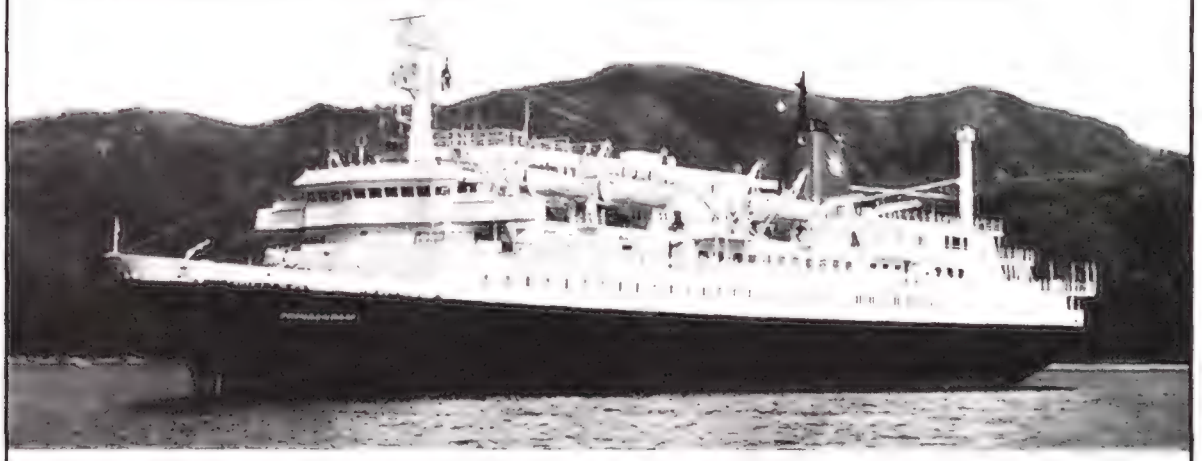

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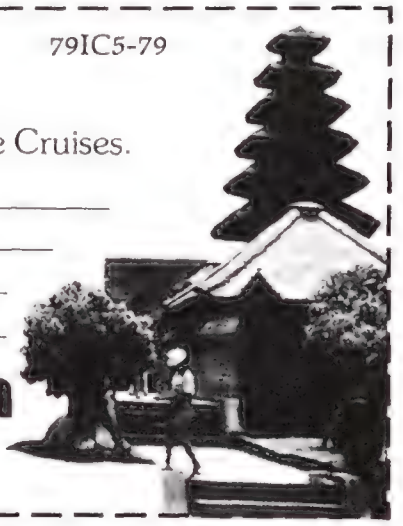

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Indonesia Cruises

I was intrigued by the display of "might-have-been" coins. There was a proposed four-dollar gold piece, a suggested gold 50-cent coin. Also, there was a massive gilt copper pattern for a $50 coin, two inches in diameter, according to Russ MacKendrick's column on numismatics in the *New York Times,* and weighing in at better than two-and-a-half ounces.

This giant, bigger than the Polish gold piece—third from bottom in the illustration—which honors King Sigismund III (1566-1632), was proposed in the 1850s as a means of organizing all that gold rush currency—bags of dust and handfuls of nuggets. The $50 coin got killed by Congress so all we have is the pattern.

The new exhibit draws on our entire money collection, not just the items from the Chase Manhattan. If you look it over, you'll find wonderfully ancient gold coins, historic American currency, money in the form of pressed tea and the bristles from an elephant's tail. Clearly, just about anything can serve as money.

Staff members of the Institution are frequently reminded that the Smithsonian doesn't really have much money. But when we look at this, plus the Lilly collection glimmering like the vaults of Fort Knox, not to mention the precious stones over at the Museum of Natural History, credibility quivers.

The delightful art show called "Calder's Universe" ends its run at the Hirshhorn on the 13th of this month. If you haven't seen it, do. Calder is funny and imaginative and so damn clever he makes you writhe with frustration.

Many things about the show tickle me —especially, I think, the wire sculptures, including one of Helen Wills hitting a tennis ball in her old-fashioned Wimbledon skirt. But two other things struck me as I wandered happily through the show. One was a color lithograph done in 1976, the year Alexander Calder died. In our exhibit (opening May 5) on aerial photography (see last month's SMITHSONIAN) we mention how artful photographers shoot down on a plowed field and make the design look like modern art. Well, this Calder work is called "Contour Plowing" and looks pretty much the same way.

My second special enjoyment came from watching the people in one display room which had a metal box affixed to the wall. This was obviously a recording device of some kind, for you could see

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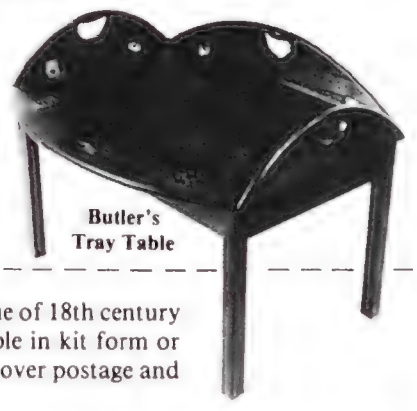

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a needle tracing a line on a cylindrical graph—I suppose to record heat or humidity which might hurt the paintings.

Anyway, the Calder lovers would wander in and stop to gaze at Calder's mobiles and stabiles and to look up at a model of one of the Braniff jets he painted. And when they saw the recording box they gazed at that, too, with the same admiring smiles, mixed, perhaps, with just a hint of bemusement.

During the Winter of the Tractors we at the Institution got quite accustomed to them—hundreds of them, flags snapping from their cabs, slogans writ large upon their sides. Several colleagues, mostly female, were given rides in them during the bitterly cold and incredibly snowy winter. They all accepted instantly. After all, it would have been pretty hard to be abducted by a tractor when the Washington police had them all corralled on the Mall. And anyway . . . a *tractor*?

All reports agree that rides are bumpy, but also warm and comfortable in the closed cab. There is plenty of room for two. The drivers came from New Mexico and Kansas and Arkansas and Texas and wanted to leave a good impression of themselves engraved on random Washington hearts, though their heavy-duty tires engraved tread marks all too firmly on the turf of the Mall.

One important thing that arose from the confrontation between farmers and Washingtonians was an awareness and appreciation of tractors. We citizens never could get it all quite straight about parity, but we did learn that big heavy-duty tractors can cost some $50,000, that they are sturdy and comfortable, that they remain imperturbably dutiful throughout long treks and despite heated skirmishes with the police.

I write this while on a working leave in Australia where I have been visiting Aboriginal settlements in the central desert area—stark, unimaginably hot, almost unbearably isolated. I have learned that Aborigines who have only recently come in from the wild soon turn to cars to give them the mobility that their nomadic souls seek. With prices the way they are, junk is all an Aborigine can usually buy, and when the junk breaks down, few drivers can do much about it. So the bones of 1951 Chevrolets and Fords now occasionally punctuate the lovely emptiness of the Outback.

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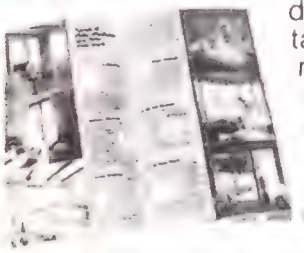

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Why doesn't the government give the Aborigines tractors, someone idly suggested during a conversation about this. And I roused myself and chimed in with the inspired thought that the greatest used tractor lot in the world, right then, was Washington's Mall.

The regional program people of the Smithsonian Associates did a turn at Denver in March, and I found myself included in the hope that I would get coherent enough to speak briefly about the Mall and what goes on around and beyond it. This was the first time I have done this on so large a scale. It felt like the last footage of those old musical movies when Don Ameche and Alice Faye finally make it to the Palace. There I was, included with such seasoned performers as David Challinor, our assistant secretary for science; Paul Desautels, curator of the Hope Diamond and all those other goodies; Jim Buckler, our horticulturist; cultural historian Richard Ahlborn; Edward Lawson of the Hirshhorn; Dick Fiske, the plate tectonics man; Dennis Stanford, the anthropologist whom I helped hack up Ginsberg, the elephant, a year ago (SMITHSONIAN, July 1978); art historian William Kloss; our Zoolab people; and, above all, the Smithsonian Chamber Players, who use antique or rebuilt 18th-century instruments for their Baroque and classical programs. We all did our gigs and shouted "break a leg!" at each other from backstage.

I became so enraptured by show biz, in fact, that only in retrospect have I fully appreciated the delights of Denver. While I was there it was bathed in bright sun, the mountains dazzlingly white, the sky richly blue. In such conditions, we wandered the huge city park, investigated the splendid museums and gorged on outrageously good food.

Above all there were the people of Denver. They came in hordes—our 25 scheduled programs were increased to 41 to take care of them—and they accepted everything we offered with surprising enthusiasm. Ah, the sound of that applause, to us actors a security blanket if ever there was one! No wonder the Associates regional program staff can't wait to get back on the road, to hit the old boards again, to sniff the grease paint. . . .

The Multiple Mirror Telescope, or MMT, opens this month atop Arizona's

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Micro TV Breakthrough

Remember the $400 Sinclair Micro TV? Here's the story on the greatest TV value ever.

That Sinclair TV shown above is small—the smallest TV in the world.

And when it was first introduced last year, it made history. So did its high price—$395.

Our company never sold the unit for two reasons: 1) It was being promoted as a pocket TV and we felt it would not fit in most pockets and 2) We felt $395 was too high a price for the unit regardless of its quality, size and features.

But we were wrong. Thousands of them were sold and it was selected as one of the most exciting new products of the year.

WE BOUGHT ONE

A few months ago we purchased a Sinclair TV and discovered another feature we didn't like. The unit included a 220-volt converter for European operation. This meant that every American who bought the set had to pay extra for the converter even though very few Americans would be taking their TV to Europe.

So we came up with an idea. We went to England and purchased thousands of sets directly from the factory without the converter. We were also able to save money by eliminating the normal mark ups by importers, wholesalers and distributors.

We can now offer you the unit for only $249.95 and if you want the 220-volt converter, your cost is only $19.95 extra.

LESS THAN WHOLESALE

JS&A would be offering the exact same Sinclair TV at a price less than Sinclair's actual wholesale price in the United States and we would still make enough profit to pay for the cost of this advertisement.

There is one feature we liked very much about the set. Its rechargeable batteries are built into the unit. Larger portable TV's offer $60 optional rechargeable battery packs that must be purchased separately. Ours is built in and included in the price.

The Sinclair TV comes complete with an American AC adapter and charger, ear phones, carrying case, rechargeable batteries and a built-in antenna for both VHF and UHF. It also comes with a cigarette lighter power converter, so you can watch all your favorite TV channels from your boat, plane, motor home or car without even using your batteries.

PHOTOGRAPHIC QUALITY

We were well aware of Sinclair's advanced electronics and quality features. But what we found particularly exciting was its picture tube. Even though the 2" (measured diagonally) tube is small, the TV's resolution resembles that of a clear sharp photograph. You can even read small telephone numbers when they're flashed on the screen.

The Sinclair unit is offered in this advertisement with the same accessories available in the $395 system with the exception of the 220-volt power converter.

The Sinclair is also convenient. You can take it on trips and entertain your children while you fly or drive. You can keep it on your desk at work and monitor the latest news or stock market reports. And you can view the soap operas as you work around the house. We even took ours to the ball game to watch those instant replays.

BIG POCKETS

But don't expect to carry it in your pocket—it won't fit unless you have big pockets. The unit measures 1⅝" x 4" x 6¼" and weighs just 28 ounces which includes the built-in batteries.

The TV is serviced in the United States by Sinclair's service-by-mail facility. If service is ever required during its one-year limited warranty, just slip it in its handy mailer and send it to them for repair. Your solid-state unit should operate for years without a problem, but if it ever needs repair, it's good to know that service is an important part of our program.

For $249.95, the Sinclair Micro TV is worth your test. Order one from JS&A. Take it with you on a trip, bring it to your office, or carry it with you around the house. See how clear and sharp the picture is and how closely it resembles a black and white photograph. Then decide if you want to keep it. If not, no problem. Simply return your TV within 30 days for a prompt and courteous refund. We just want you to prove to yourself, the miracle of space-age electronics before you decide.

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Mount Hopkins with considerable to-do, including a major article in this SMITHSONIAN (see p. 42). I left entrancing Denver, wandered down to delightful Tucson, and inevitably wangled a ride up to the observatory to see it for myself.

My guide and mentor was Dan Brocious, who knows a great deal about the MMT and Mount Hopkins, but who modestly maintains that he got his job only because he could handle four-wheel-drive vehicles. He has taken up groups of Air Force cadets, astronomers, international television crews and also a huddle of novitiates who, remarked an astronomer, might get rid of a few bugs.

We left Tucson very early, and the highway was smooth and fast, and my notes are legible: "Mission of San Xavier del Bac bright white in sunrise . . . Saguaro, cholla, mesquite, paloverde. Haze from copper smelter. Green Valley retirement community. Interested in MMT because they can see it, and many are Smithsonian Associates anyway, says Dan. Prickly pear, ocotillo, mistletoe in trees. Violet mountains are in Mexico, 28 miles away."

At the Smithsonian base camp at Amado we switched to a tough old van to tackle the mountain road. The notes get pretty sketchy: "Gambel's quail—tuft like cockade. Red-tailed hawk. Lone saguaro. D says harlequin quail farther up, also wh tl deer, stead of muleys."

Three protruding humps on Hopkins' shoulder are the Three Sisters. They look like three shawled women, bent forward, hurrying to market. Dan says they're named for three nuns who were with Father Kino on his trek toward California. They got lost here and disappeared. "Is that true?" I ask. "No," says Dan, "but there should be a story behind a name like 'Three Sisters,' so I made it up."

We pass a hairpin turn where, if I read my scribble right, 40-foot buses full of visitors had to back and try again to get around at an open house last year. "Shld b ok May opng," I add comfortingly.

And finally: "Pass trk named 'Senor Sno Ball.' Other vehcls—'Smokey, Bumpy, Greeney, Petrocelli.' Why 'Petrocelli'? Don't know. Last grade ver stp—26°. Wow. Grt view. Sign on MMT: 'WARNING: BUILDING ROTATES.'"

My notes run out along here. You'd better turn quickly to p. 42 to learn what this beautiful and extraordinary site is all about.

—EDWARDS PARK

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These new headlamps are being put into practical use this year on at least one 1979 auto. And they're planned to be used much more extensively on the 1980 models.

There may be a shortage of fuel in this country today. But thank goodness, as always, there's no shortage of ingenuity.

GTE

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"Compound eye" of the Multiple Mirror Telescope gazes, unblinking, at the Arizona sky.

By James Cornell

On a mountaintop in Arizona, things are starting to look up

A new breed of optical telescope, the MMT uses lasers and an array of six mirrors to bring astronomical mysteries into focus

First, the MMT doesn't look like an observatory. Rather it squats, blocky and fat, on an Arizona mountain peak like a misplaced Miami condominium or giant Bauhaus barn exiled to the wilderness.

Second, the MMT doesn't behave as a building should. The entire four-and-one-half-story structure, from rooftop to ground level, rotates.

And, third, the instrument inside this revolving barn isn't a conventional instrument, either. Instead of a single great glass disc, the MMT's six primary mirrors are linked together by a cat's cradle of metal struts and electronic nerve ends.

Although these incongruities may be problematical for casual visitors, astronomers see the odd features of the MMT, or Multiple Mirror Telescope, as portents of astronomy's future. Indeed, when the MMT is officially dedicated at the Smithsonian's Mt. Hopkins Observatory on May 9, it will mark the birth of a new generation of large astronomical telescopes.

A joint effort of the Smithsonian Institution and the University of Arizona, the MMT represents a major departure from traditional telescope design. Instead of using a single mirror, the MMT employs its six primary mirrors, each 72 inches in diameter, to create the light-gathering power equivalent to a conventional telescope with an aperture of 176 inches.

The light from distant celestial objects captured by the individual mirrors is brought to a common focus and, through an electronic control system utilizing smaller movable mirrors, lasers, and on-line computers, is maintained as a single image.

Already the world's third largest optical telescope, exceeded only by the 200-inch Hale reflector on Mt. Palomar and the 236-inch Soviet telescope in the Caucasus, the MMT is also the prototype for even larger—perhaps much larger—telescopes of similar design in the future.

In a very real sense, the MMT is a response to, and possibly the resolution of, a problem that has plagued astronomers for years. To extend the boundaries of the known universe, ever larger telescopes are needed to reveal ever fainter and more distant objects. But simply scaling up the size of existing instruments is not practical, because mirrors—and their support systems—eventually reach a point where they collapse under their own weight.

Faced with the demand for a design that did not depend on sheer brute strength to maintain sharp images, Smithsonian and University of Arizona astronomers began nearly a decade ago to explore the more radical

A longer view shows four-and-one-half-story building that turns with telescope, and summit of Mt. Hopkins.

Photographs by Gary Ladd

Beyond telescope (wrapped in plastic to protect it during construction) is steep, winding approach road.

approach of creating a telescope with multiple mirrors.

The idea itself was not new. Interferometry, the technique of using two separated mirrors to detect minute differences in the arrival times of light from a distant star, was a principle well understood, and had been utilized with some success. The less exacting concept that similarly shaped, but separated, mirror surfaces could bring light to a common focus was also known—and had been attempted—by scientists. But the sticky and nearly insurmountable problem of keeping the images superimposed remained.

The solution to the imaging problem came in part from the space program. Advances in laser technology and the manufacture of superminiature computers finally made it possible to build instruments in which high image quality could be maintained by automatic electronic sensing and control systems rather than mechanical devices.

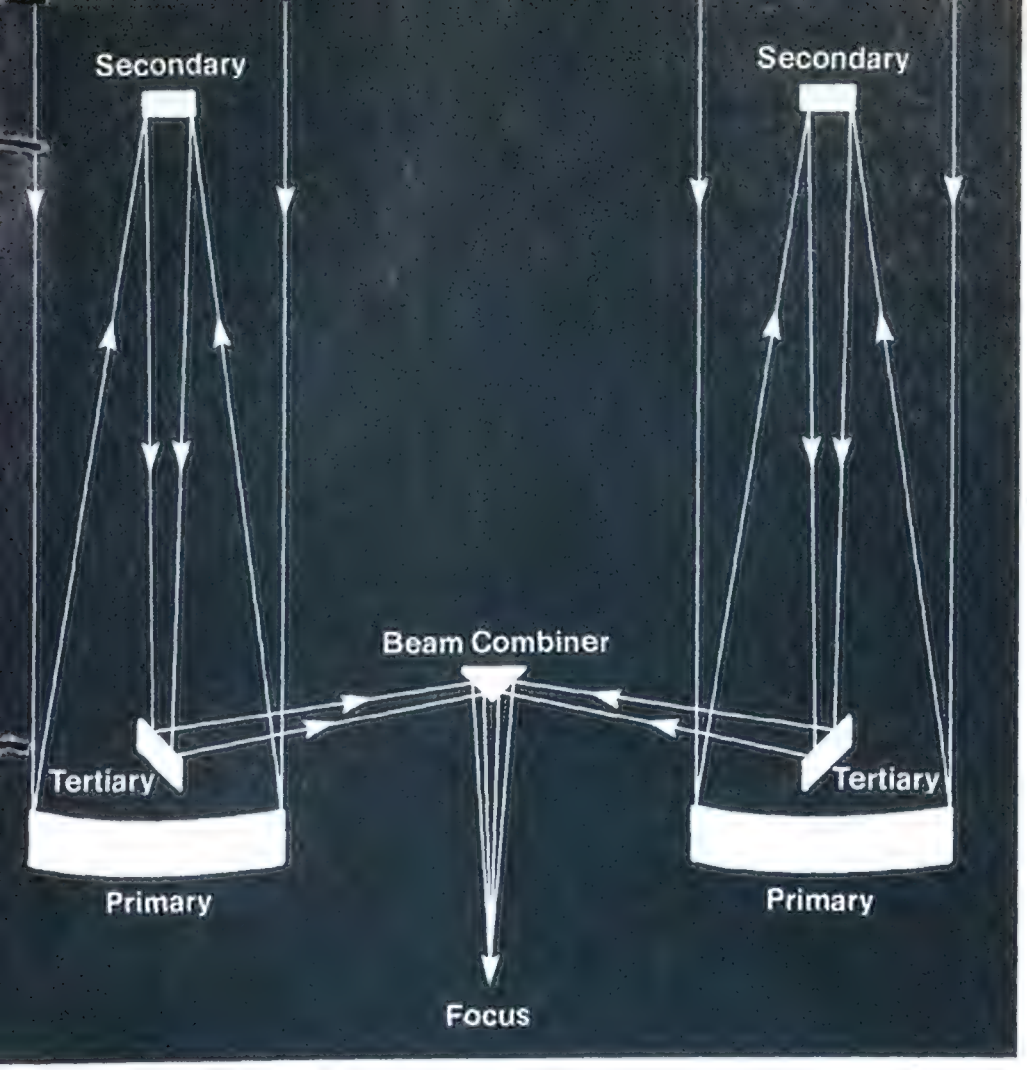
In 1969, optical expert Aden Meinel and infrared astronomer Frank Low at the University of Arizona put forward the basic idea of a six-telescope cluster, prompted by the availability of some relatively lightweight mirror blanks from a U.S. Air Force technology development program. Independently, a study group at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, including then-director Fred L. Whipple, astronomers Nathaniel Carleton and Lawrence Mertz, and engineer Thomas Hoffman, was exploring multiple mirror designs for a large telescope proposed for its Mt. Hopkins Observatory in the Santa Rita Mountains, 38 miles south of Tucson near Amado, Arizona.

When these groups became aware of each other's activities, Whipple proposed a collaboration that was eagerly embraced by the two scientific staffs. Whipple appealed to Congress, through the Institution, for support and the University turned to its state legislature. Funds were granted for an unusual federal-state program to produce what promised to be an unusually low-cost astronomical facility.

In 1972, work began on the MMT: the University's Optical Sciences Center would prepare the mirror blanks for astronomical use, the University's Steward Observatory would design the active optics and guidance systems, and the Institution's Astrophysical Observatory would prepare the site and construct the mount and building.

In the final design six independent Cassegrain (a French physician who invented the design in 1672) reflecting telescopes work in concert to produce a com-

James Cornell, publications manager of Smithsonian Astrophysical Observatory, has followed MMT from design to dedication. He has written several books on popular science.



Light from celestial object (white lines) is focused by each primary mirror so that it travels to secondary mirror, down to a third, then to beam combiner. From there the six images come to a common focus.

mon image. Starlight enters each telescope individually, travels down to the primary mirror, bounces to the secondary near the open upper end, and then bounces back again to a third mirror at the center of the primary. From this third mirror, the light from each telescope is relayed into the center of the array, producing a pattern like the spokes of a wheel. A pyramid of mirrors at the center combines the beams and redirects the light, now as a single image, to recording instruments located at the focal point behind the telescope (above).

"The real challenge," says Michael Reed of the University of Arizona, who helped develop the guidance system, "was to devise a way for maintaining a stable image each time the MMT changed position or when temperature variations in the observing chamber caused any one of the telescopes to point in a slightly different direction."

The solution was an active optics system that keys each large telescope to a small guide-alignment telescope that projects an artificial star image. In simple terms, the guidance system sends light from this artificial star—actually, a laser beam—speeding through the entire optical system until it is intercepted at the back of the MMT by electronic detectors. Those detectors, together with the small on-line computer, position the secondary mirrors to correct for any disturbances or misalignments so that the six artificial stars become one. Simultaneously, the six images of true starlight are also brought into common focus, becoming a single, much stronger, image.

The MMT's active optics system might be compared with human eyes. Each eye focuses independently and two separate images are transmitted to the brain. Our cerebral computer does a quick calculation and signals back through the nerve to the muscles controlling the eyeballs. These muscles make minute adjustments so that the individual eyes are realigned and refocused. The two separate images thus become one back in the brain. All this happens instantaneously, of course, as we turn our heads or move toward or away from objects. Just as the computer in our head helps maintain a clear, precise visual picture of the world, the computer-laser system in the MMT maintains a steady, well-focused optical view of the heavens.

The use of separate reflectors, each folding its light path several times over, means the MMT is extremely compact, with its focal length no longer than that of any one of its six components. Moreover, the 20-odd optical elements and associated electronic hardware are carried on a simple altitude-azimuth mount, rather than the complex equatorial mount used for most large telescopes. These mounts have one axis pointed toward the North Pole, and telescopes mounted on them track stars by rotating around this axis. To hold a large reflector on an inclined axis, however, requires a massive and cumbersome structural support.

By contrast, the MMT's mount turns like a naval gun, around the compass points in azimuth and up and down in altitude; thus the support structure holding

Buried electric heaters melt snow to make winter going easier on last 1,200 feet of road to the summit.

One of the six 72-inch mirrors is polished at University of Arizona's Optical Sciences Center.

University of Arizona

A secondary mirror hangs in the center of this view from the back of the telescope. The main mirrors

the telescope optics experiences little stress and can be of a relatively lightweight construction.

Astronomers traditionally have resisted such mounts because star tracking requires rotation around both axes simultaneously, with continuously varying tracking speeds. Again, however, the MMT's on-line computer control allows rapid and automatic calculations of the correct rates.

Because the MMT, like other large telescopes, was so dependent on electronics for both operations and observations, Nat Carleton and Tom Hoffman, who had by this time become the Smithsonian's project scientist and chief engineer respectively, sought a means for placing these systems near the instrument. The answer came in part from the simple motion of the MMT's mount. Because at least the top half of this building had to turn with the telescope in the azimuth direction, the Smithsonian designers suggested that the entire building could rotate. And, by eschewing the traditional dome shape and giving the MMT building a square-shouldered barnlike configuration, more control-room space was made available.

Thus, the entire 500-ton facility—offices, labs, workshops and lunchrooms—turns slowly on steel wheels riding on a circular track. The telescope itself, standing on an independent pier anchored in bedrock, turns simultaneously on its own bearing. Together, building and telescope have become a single, giant instrument.

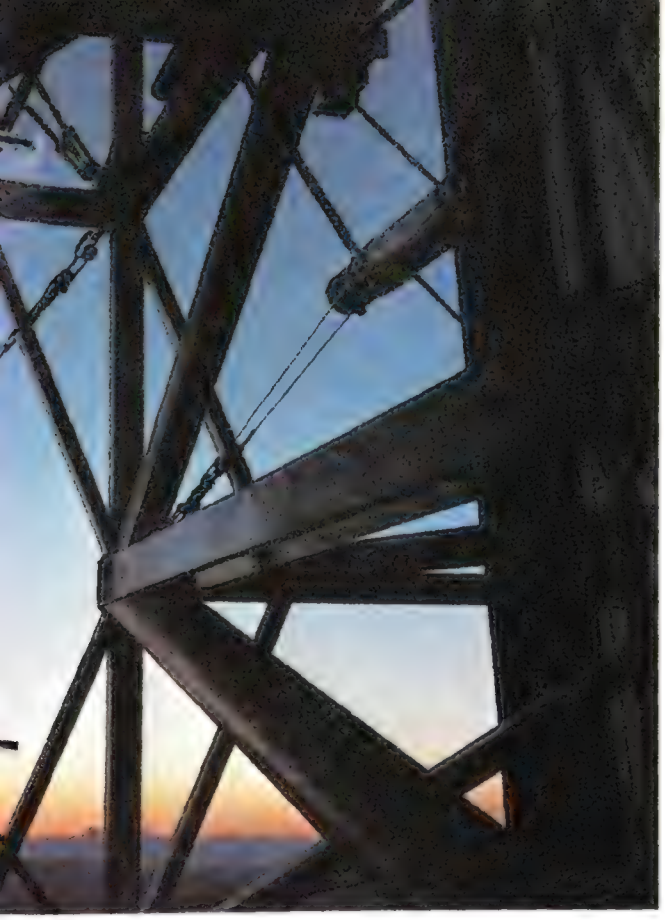
Actually, even when the facility turns at top speed, the motion is hardly perceptible to anyone inside, unless one happens to glance out the window and see the other peaks of the Santa Rita Range gliding by. However, Carleton notes, "Pool is the traditional cloudy night pastime of astronomers, and it will require special skill if played in the MMT building."

For obvious reasons, perhaps, it is the turning building that most amazes the casual visitor to Mt. Hopkins. After driving up the 18-mile winding, narrow, dirt trail from Interstate 19 at Amado to the 8,585-foot-high summit (pp. 50-51), most people are more fascinated by where the MMT is than why it is.

The road to the MMT and the other facilities of the Mt. Hopkins Observatory passes through a representative slice of Arizona landscape, providing visitors with a minitour of the state's varying climatic zones. Beginning in a fertile valley of working ranches near Amado, it rises rapidly to cactus-studded desert uplands, passes through wooded canyons, and then snakes along the precipitous side of the mountain itself.

According to local folklore Mt. Hopkins, the second highest peak in the Santa Rita Range, was named for a 19th-century mining engineer ambushed by Apaches. The multiple-use policy of the U.S. Forest Service means that the area is laced with rough trails used by hunters and weekend hikers. The stone cairns of amateur and professional prospectors, marking staked claims, can be glimpsed from the road.

The Mt. Hopkins Observatory itself is the largest field installation of the Smithsonian Astrophysical Observatory. Since its official opening in 1968, the 4,774-acre site has been used for those experiments requiring extremely dark skies, dry climate and good optical "seeing." Although the MMT sits on the very summit, from where one has a breathtaking view of the entire Santa Cruz Valley from Nogales, Mexico, in the south to Tucson in the north, other major instru-



have a much narrower field of view, and thus do not "see" superstructure that seems to be in the way.

Although carrying no 16-inch guns, the MMT and its housing move together like a battleship gun turret.

ments are strung out on a half-mile-long ridge at the 7,600-foot level. These instruments include a Baker-Nunn camera and laser ranging system for tracking artificial satellites, a part of the Smithsonian world-wide network; 60-inch and 24-inch reflecting telescopes; and a 34-foot gamma-ray reflector.

Despite all this astronomical activity at the upper levels, the rest of the mountain still retains its primitive character, and bears, mountain lions, javelina, white-tailed deer and coatimundi live in apparent harmony with scientists and technicians. (Although the wild animals pose little problem for the MMT users, a stray steer, drawn up the mountain by some unknown urge, occasionally positions itself dead center in the one-lane road, stopping all traffic.)

For all its idyllic charms, a mountain peak is not the ideal place to build anything, let alone a delicate, complex, one-of-a-kind scientific instrument. Under the supervision of site manager J. T. Williams, equipment and components, from the huge segments of the mount to the small tertiary mirrors, plus tons of steel and miles of electronic cable, had to be carted up this one-way, dead-end road by truck. On the last gravity-defying 1,200 feet to the summit, the flatbed trailers usually were accompanied by two bulldozers: one in front to pull and the other in back to serve as an emergency brake.

To further complicate matters, at the height of MMT construction—just as mirrors, guidance systems, and computer control all finally came together for installation and testing—southern Arizona was struck by the worst rains in recent memory. Four successive floods in 1977-78 severely damaged bridges along the Santa Cruz River from Nogales to Tucson, wiping out the link between the MMT and the Smithsonian's field office and staging area in Amado. With helicopter airlifts and regular fordings of the sometimes hazardous river the work went on. And during two winters of unusual severity the Mt. Hopkins support crew led by Don Hogan worked long hours to keep the road cleared of snow, ice and rockslides. Despite the unexpected delays and increased costs of construction and road maintenance, the final price tag of the MMT is about one-third that of a conventional telescope of comparable size, or about $8 million.

The cost savings alone make the concept of multiple mirror telescopes particularly appealing for other applications both on the ground and in space; but the possibility of creating truly immense optical instruments is also tantalizing to astronomers. William Hoffman, the University's project scientist for the MMT, predicts: "It may soon be practical to make telescopes with many more than six mirrors. In effect, we could produce an instrument with the light-gathering power equivalent to a 1,000-inch telescope." Already, groups at the University of California and the Kitt Peak National Observatory have begun designs for telescopes up to this size.

The MMT is more than just a test model for larger instruments of the future, however; it is a working scientific instrument. Appropriately, today's technology—particularly advances in computers and transistor electronics—will significantly shape the investigations of this generation of telescopes.

The computer control system that will automatically realign the eyes of the MMT may also help to

Smithsonian Astrophysical Observatory

A galaxy known as NGC 2903, a barred spiral some 300 million light years away, is revealed in test

remove much of the drudgery from observing. According to Herbert Gursky, a Smithsonian specialist in x-ray astronomy: "A scientist may come to the MMT armed with lists of objects to be observed, punch in a set of numbers at the computer console, and then sit back while the telescope automatically and accurately proceeds from object to object with little or no human intervention. For certain observations, the scientist might not even be present, because the data can be taken and stored for later analysis elsewhere."

Indeed, under the proposed operations plan, lists of objects from several scientists at different institutions can be sent to the telescope in advance and the computer will develop a plan that minimizes the time required to move from object to object and makes the most of observing time. Because the MMT is certain to be oversubscribed, this feature should ensure access for many more users. Actual observing time on the MMT will be divided equally between the Smithsonian and Arizona, with time also available for investigators from other institutions.

A dramatic and far-reaching change in observing techniques may come from the application of new devices known as "self-scanning diode arrays." The diode arrays are by-products of transistor technology that allow cramming thousands of electronic circuits into fingernail-size wafers composed of 10,000 to 100,000 individual light-sensitive elements. The most common material used is silicon, which records more than half of the photons of light falling on its surface. (By contrast, even specially-treated photographic film can capture only about four of every hundred.)

Two diode-array instruments will be operated on the MMT: the "redshift machine," a high-gain spectrometer developed by colleagues at the Harvard College Observatory, and the CCD (charge-coupled device) camera, a solid-state optical detector.

The redshift machine measures the shift toward longer—or red—wavelengths in the light that reaches us from distant galaxies. This measurement is vital to determining the size of the universe, because galaxies appear to be receding from us at speeds in proportion to their distances.

While the redshift machine's data show the spectra of celestial objects, the CCD camera can be used exactly as a television camera to produce images of very faint objects, either for immediate viewing or for storage (above).

A major objective of both instruments is to study large numbers of the most distant galaxies in both optical and infrared light in an effort to produce better "maps" of the universe. In one sense, we have already mapped out our immediate neighborhood, or more

image from electronic camera designed for MMT.
Picture was made on Smithsonian's 60-inch telescope.

properly, our "time zone"; to produce an atlas of those areas beyond this zone, we must look farther into space, a task that requires better light collecting.

Because the incredible distances of space are measured not in miles but in light years, to look deeper in space is also to look far backward in time. The light from the most distant objects reaching telescopes on Earth actually originated some billions of years ago. Theoretically, then, if one could look beyond the edge of the now-known universe, or some 15 million years into the past, one might see light from those stars formed by the first primordial explosion. Perhaps one could even see that explosion, or "Big Bang," itself.

Naturally, light traveling so long and far through space is extremely faint. By increasing a telescope's light-collecting ability, either through greater size or by improved instrumentation, more of this light can be collected and, more important, analyzed. Its faint spectrum can be dissected, the components classified, and information extracted to reveal the chemical and physical properties of the bodies that emitted the light so long ago.

Most important are the measurements of distance made possible by the spectra obtained on the redshift machine. At the very limits of current astronomical telescopes are seen strange, powerful sources of light, radio and x-ray emission known as quasi-stellar objects or quasars. Although they look like stars, their red shifts indicate they are receding from us at velocities almost 90 percent that of the speed of light. Translated into time, that means the light has been traveling more than ten billion years before it reached us. To be seen at such distances, these objects must be extremely powerful, perhaps more energetic than a billion stars combined. The MMT astronomers, working in cooperation with astronomers using radio telescopes and satellite observatories, may both help understand what drives these incredible energy machines and provide some clues to the processes that created them.

Looking at how stars are born

The MMT is especially well-suited for infrared observations and is the largest telescope ever constructed specifically for this purpose.

Infrared astronomy is a burgeoning field that has gained impetus in the past two decades, partly from new solid-state detectors and satellite and balloon-borne experiments. Among the interesting objects to be studied in infrared are "cool" stars, many times larger than our sun but only about one-third its temperature. Other objects are celestial newcomers, so young they have hardly begun to use their internal fuel supplies and are still shrouded in clouds of the dust and gas out of which they are forming. Also intriguing are suspected "protostars," even newer objects evolving so deep in these clouds that only the infrared radiated by the dust cocoons belies their existence. Still other objects emit abnormal amounts of both radio and infrared radiation, but are virtually invisible to optical telescopes.

By looking in the infrared region of the spectrum, the MMT is expected to reveal new information about the birth of stars. More important, it may better define conditions at the heart of our own Milky Way and in the cores of more active galaxies, where inordinate—and so far unexplained—amounts of infrared radiation have been seen.

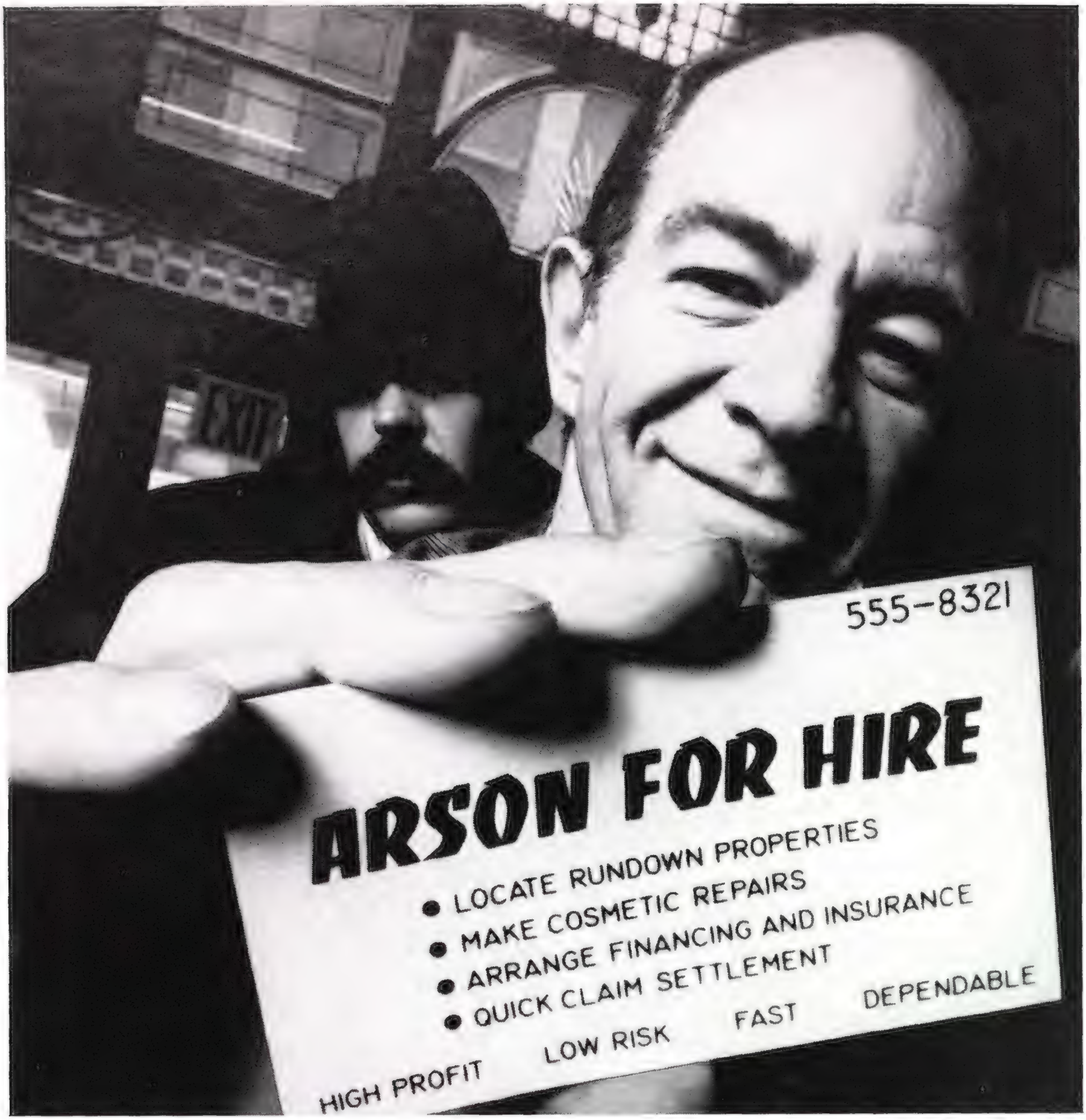
In the end, however, no scientist can—or would—predict exactly what the MMT may do. This attitude is hard to explain to efficiency experts who demand

A six-eyed telescope turns to the sky

immediate payoffs for dollars expended, but as Neville Woolf, the British-born Steward Observatory astronomer who has served as the MMT's Acting Director, explains it: "The research programs of large telescopes are seldom confined to any preconceived plans. Each time the MMT points at a new object, it may reveal something never before known to science."

Throughout the history of astronomy, the introduction of new instruments has inevitably led to new discoveries affecting both astronomy and philosophy. The first observations made by Galileo in 1609 with a crude telescope revealed that the Earth was a vassal of the sun and that the sun itself was only one among millions of suns in the Milky Way. The great reflectors of the early 20th century showed that the Milky Way was itself only one among untold millions of other galaxies, all aswim in a universe that stretched beyond sight. The ground-based radio telescopes and space telescopes of the last two decades, in turn, have shown this universe to be populated throughout by mysterious and violent objects such as black holes, pulsars and cosmic bursters. The universe is no longer seen as a static void dotted with immutable objects, but rather a dynamic place, seething and churning, exploding in birth and contracting in death as the stars play out an evolutionary scheme on a scale far vaster than anyone can conceive. Perhaps, like the innovative astronomical tools that preceded it, the Multiple Mirror Telescope will also reveal new visions of the cosmos.

The MMT looks Christmas-card cozy in the picture at near right, although its real geometry—the isolated splendor of the mountain where Man contemplates the universe—shows better in photograph at far right.



Does an organization like this exist in your city?

No? The people of Tampa, Florida thought "No" too. Yet a ring just like this flourished there for four years.

Until a crack arson strike force closed in and convicted 19 of its "employees." In two years, Tampa arson fires dropped

47%, which gives you some idea how much damage arson for profit can do.

Can you fight it as successfully as Tampa did? You can. Finally, the laws and tools are in place:

For the first time, arson is classified as a "Part I" crime by the FBI—on a level with murder and forcible rape.[1] (And about time—arson cost over a billion dollars and 700 lives in 1977!)[2]

For the first time, *local* prosecutors are working with federal officials, using mail-fraud and racketeering statutes to bring sophisticated law enforcement forces to bear on this crime.[3]

And Ætna, together with other insurance companies, is marshalling its resources: gathering information, planning anti-arson seminars, encouraging arson control programs and advocating tougher laws to increase the prosecution of arsonists.[4]

Arson is a crime we all have to pay for. Your help is needed to stop it. Don't underestimate your own influence. Use it, as we are trying to use ours.

Ætna wants insurance to be affordable.

[1] One result of this re-classification—passed by Congress in October of last year—is that the FBI will publish statistics on the incidence of arson in every major city. This means increased public scrutiny—and public outrage—at the rate of arson in this country, and *that* is an important precondition for action!

[2] These shocking statistics are from a 1977 study by the National Fire Protection Association. Of course, arson-for-profit is only part of the problem. Vandalism, arson-for-revenge and arson to cover up *another* crime also contribute to this loss.

[3] A little-known federal law with the name of "RICO" (short for the "Racketeering Influenced and Corrupt Organizations Act of 1970") gives the justice system the tools to charge, indict and convict members of arson conspiracies like the Tampa-based organization.

[4] To coordinate industry efforts with government agencies and neighborhood groups, the Insurance All-Industry Committee for Arson Control was established in 1978.

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Photographs by Fred J. Maroon

The kings depart but Egypt's land and humble fellahin are with us yet

The deserts, the Nile and the peasants all fulfill the same roles they played when the Pharaohs ruled this old land

In 25 years as free-lance photographer, Fred J. Maroon has seen his news, fashion, food and travel pictures and articles published in national and international magazines. The Egypt Story *is his fourth book.*

This article is adapted from the book The Egypt Story: Its Art, Its People, Its Monuments, Its History, *by P.H. Newby, produced by Chanticleer Press and published this month by Abbeville Press, Inc.*

Bench in front of the coffeehouse serves as a vantage point on the world. After work, these men survey the scene on a side street off the Muski, main avenue of Cairo's medieval district.

An Egyptian man may be as white as a European or very dark indeed, and it is customary to relate the coloring to the degree of latitude—fairest in the north, browner in the south. But the generalization is only broadly true today, for there has been much movement of population in this oldest of the Earth's nations. Certainly the fellahin who work in the fields are darker than the storekeeper or teacher, but that is because they are out in the sun all day; and they are darker, too, than their more stay-at-home wives.

In the tomb paintings men were often shown red and women white or yellow, for the same reason. The eyes are usually full and beautiful in women; the men have a more hooded expression, and the fellahin in particular have a habit of keeping their eyes half closed and lowering their eyebrows in a way that seems to be an expression of displeasure but is really what one has to do in bright sunlight if one is not wearing tinted glasses.

There are not many fat Egyptians. People present their bodies well. Women walk erect like queens because, it is said, they are accustomed to carrying burdens on their heads. But men walk well, too, in their loose turbans and long gowns, called galabeyas.

The real continuity in Egyptian history is provided by the labor of the peasants. The fellahin think of a three-season year, as their remote forebears did—summer, flood and winter. The repetition of the annual flood, generation after generation, accustomed the Egyptians to a cyclical rhythm in life. There is a difference nowadays, because the Nile has been tamed. But the same kinds of plow and hoe are used to break the soil, the same *shadouf*—a bucket suspended from an arm which has a counterweight—to minimize the labor of lifting the water. The movement and control of water has been the fundamental Egyptian labor.

As the Moslem centuries went by, the peasant grew his crops by methods that would have been familiar to his ancestors under Ramses II. The work is still of a kind one sees in the tomb paintings—smelting ore, raising water, tending the waterwheels of the Faiyum, which still groan away as they did when this depression below the level of the Nile was first irrigated (by the Old Testament Joseph, some people say).

Yet the fellahin are the unknown Egyptians of today. Nowhere are they less accessible than in the most northerly part of the country, the Delta. Communications are still difficult, tourists do not go there, but it is here the fatalistic, good-humored fellah (his ancestors may have built the Pyramids) is to be found.

Photographs © Fred J. Maroon, 1979

If the tourist cannot imagine an Egypt without the pyramids, neither can the peasant in this land studded with massive tombs of long-dead kings. The pyramids seem always to have been here—the three on these pages were built some 5,000 years ago—as arresting symbols of a way of life made rhythmic by the indispensable river, but made changeless by the sun.

Earlier pyramids evolved from simple oblong mud-brick structures, known as mastabas (the Arabic word for mud benches), which went before. The Step Pyramid at Sakkara, a pleasant camel ride from Giza, suggests a staircase to the heavens. Today, when one stands at the foot of the Great Pyramid (at far right) and looks up its dilapidated flank to the remote summit, one gains a sense of aspiration to the heights.

Once sheathed in smooth limestone that dazzlingly reflected the rays from above, they became, millennia ago, as rugged as they will get in anyone's lifetime. They stand as silent sentinels attesting, for all the impermanence of the world outside, to the permanent nature of the desert, the sun, the universe, the infinity toward which they reach—an infinity the peasant accepts, and in the midst of which he feels comfortable.

Upper and Lower Egypt, astride the great Nile, share dependence on its life-giving waters.

The Pyramids built at Giza after 2700 B.C. are the largest and finest examples to be found in Egypt.

At the foot of the Great Pyramid is a royal cemetery and remains of a temple. Beyond is the Nile valley.

Something like 40 percent of the Egyptian population now lives in towns. People everywhere want to live in towns and cities because of the facilities urban life provides. Still, we must not forget that the heart of Egypt is agricultural. All depends on the man with his hoe turning the little ridge of earth so that the irrigating water flows this way one month and that way another. On an act as simple as this a complex civilization has depended.

The peasant is eternally making and remaking small earth barriers (called *sadd*) to control the flow of water. The wheat field has to be watered four times during the six months from November to May—from its planting, that is, to harvest. Cotton is planted in February and March, watered eight times before it is picked in September and October, then left to stand in great bales for the export market. Potatoes need even more water and so, naturally, does rice.

The detail of this ritual came into existence when Nile waters were controlled to make irrigation possible throughout the year. Before that the Nile overflowed and grain was scattered broadcast on the mud. When the water receded the seeds were trodden in by animals or by pieces of wood dragged over the ground —as it is still done in some areas today.

Some dramatic statistics: fertile Egypt is 800 miles long and, at Kalabsha, 50 miles above Aswan, narrows to 170 yards wide. South of Cairo the widest extent of the irrigated area is only 13 miles. Around Thebes the cultivated Black Land extends between desert and desert. Fields of barley, maize, wheat and sugarcane fill the flat land between one ruined temple and the next.

This country has survived many invasions. What kept Egypt going during difficult years was, as usual, the labor of the peasant who worked to fill his mouth and that of his family; beyond that, to provide his masters with the grain, fruits and vegetables this still wonderfully fertile country produced in such abundance.

In his tomb, Sennedjem, a royal artisan, is shown with his wife, ceremonially harvesting in the afterlife.

In the fertile land of Egypt, many fellahin still turn the earth with a primitive wooden plow

and harvest their wheat by hand with a sickle, much the way it is depicted in ancient tomb paintings.

The Nile has always been a favorite resting place and feeding ground for thousands of waterfowl. Nowadays Egyptian geese, at left in the photograph, and migratory gulls at right, congregate there with spoonbills and avocets. In dynastic times the river was also a sanctuary for the sacred ibis, one of which is shown being flushed out of papyrus with pintail ducks, in the tomb painting below. Along with the crocodile, another river dweller, the long-beaked bird was venerated as a god. The ibis disappeared from Egypt a century ago.

The deity that took the form of the sacred ibis was Thoth, god of wisdom and as such the scribe or secretary to all the gods, especially Osiris, whose yearly death and rebirth testified to the land's reliable fertility. Perhaps to perpetuate the powers of Thoth and his symbol, whole troops of the sacred ibis were mummified and laid to rest in cemeteries, and the ibis itself became a hieroglyphic symbol for the continuity of life.

Startled by a hunter's throwing-sticks, ducks (an ibis is at right) rise from a papyrus thicket.

As they have for millennia, birds nest and feed along the Nile at Luxor, site of what was once a world-

famed city. Stratification of far bank is caused by silt deposits from the river's annual flood.

Near Kharga Oasis in the Western Desert is "Valley of the Melons," so-called for the appearance of its worn rocks. They lie on a limestone plateau, eroded by temperature changes and by wind.

Most of Egypt is occupied by the Western Desert. It contains the greatest of Egyptian oases, the Faiyum, where grapes, prickly pears, guavas, mangoes, eggplants and artichokes flourish, and also the oases of Bahariya and Kharga, which the Greeks called the Great Oasis. The rest is sand, vast enough to swallow armies. At least one army, that of the Persian King Cambyses, disappeared without trace in 524 B.C., but may yet be found with its baggage train, if the wind shifts, preserved in some arid depression.

There is no rain whatsoever, except on some freakish occasion. But these arid uplands have fossil water deep underground—something like six million cubic meters, it has been calculated. This is water that in all probability fell in the form of rain in some remote geological time and has been trapped ever since. Artesian wells and springs have been exploited for a long time, but only in recent years has the real wealth of water been discovered, by accident almost, for it was a by-product of drilling for oil.

When methods are found to bring this water to the surface, and use it for irrigation without its evaporation leading to a salination of the soil, there is obviously room for a considerable increase of agriculture.

The mountainous Eastern Desert is the most rugged-looking part of the country. In ancient Christian times it was the most terrifying place that holy men could find in which to mortify the flesh.

The energy for raising the water will presumably come from electricity generated at the new Aswan High Dam two to three hundred miles away, but salination is a bigger problem.

The limestone hills in this Western Desert are not spectacular like the mountains on the other side of the Nile, 300 miles to the east. These mountains of the Eastern, or Arabian Desert, rising only a few miles from Cairo, once gave gold, silver (but not much) and copper. Beyond them and the Gulf of Suez is Sinai and the place where Moses received, more than 8,000 feet above sea level, the Ten Commandments.

So far as is known the rough terrain of the Eastern Desert does not overlay any vast, prehistoric sea of fossil water. The mountainous bluffs do bear a kind of clay called *maroq*, containing nitrate, and the fellahin transport this fertilizer down to their farms by mule or camel. They break up the clay with an all-purpose implement, a kind of mattock or hoe variously called a *touriah* or *fass*. It is also used to knock down the little embankments to permit water to run along the farmer's furrows, and to dig holes for hiding wealth from the tax man. It is the same instrument depicted in the wall carvings of ancient Egyptian tombs.

When the evening sun goes down in the desert west of Lake Nasser, it provides a "double sunset"—one as it sinks below the sandy horizon and a second, following the twilight "blue hour," a magenta glow caused by a refraction in the atmosphere. This effect was caught by Maroon in the photograph on these pages.

Near here, the first Aswan Dam was built in 1902 at a point where hard rock cuts across the Nile valley. This provided a base for the dam, which created a lake kept artificially low so as to preserve the ancient temples of Philae (SMITHSONIAN, February 1976). And that provoked a British journalist to say that this was "the most cruel, most wicked and most senseless sacrifice. . . . The State must struggle and the people starve, in order that professors may exult and tourists find some space on which to scratch their names. . . ." The journalist was Winston Churchill.

This year the new High Dam upstream from the old one will create a lake larger than England. It arrests the load of silt that used to flow seasonally downriver, a controversial development, and this presumably will require the use of more fertilizer in the Delta. The advantage is that water can be released throughout the year to increase the area of land under cultivation.

The creation of Lake Nasser meant that the huge statues of Ramses II, his chief wife Nefertari and other relatives, would be submerged. So they were sliced out like so much cheese and moved to a higher point. Ramses would have thought it was the least he deserved. Now the figures look out over the lake, which will play an as yet undetermined role in the future of the country ruled by Ramses II 3,300 years ago.

Lake Nasser, behind Aswan High Dam, helps control the Nile waters but traps fertile silt.

Set a Smithsonian table.

1. A TIMELESS BEAUTY is reflected in our sterling silver flatware. "Smithsonian", created by contemporary American craftsman Ronald Pearson, found its inspiration in silverware owned by John Quincy Adams and his wife, Louisa. Pearson's design, as elegant and beautiful as the original in the Smithsonian Collections, has been translated by the Stieff Company into a pattern that is appropriate for the contemporary as well as traditional tabletop. The four-piece place setting consists of dinner knife, dinner fork, salad fork, and teaspoon. One 4-piece place setting: 342287 $195.00 (Members $175.50) (s/h $3.00). Eight 4-piece place settings: 342295 $1,560.00 (Members $1,404.00) (s/h included). Dinner knife: 342469 $43.33 (Members $39.00) (s/h $1.00). Dinner fork: 342477 $70.00 (Members $63.00) (s/h $1.00). Salad fork: 342485 $56.00 (Members $50.40) (s/h $1.00). Teaspoon 342493 $47.33 (Members $42.60) (s/h $1.00).

4

4. ENHANCE YOUR TABLE with the beauty of your own craftmanship. These placemats and napkins are certain to be admired by all who dine at your table. The crewel design was inspired by the decoration on a Meissen vase made around 1725–1735, and now in the ceramics collection of the Smithsonian's National Museum of History and Technology. Each kit contains hand washable fabric (a cotton and linen blend), instructions, embroidery thread, and needle. Kit for four placemats 18" × 13-3/8". 360222 $11.50 (Members $10.35) (s/h 1.00). Kit for four 18" square napkins. 360230 $11.50 (Members $10.35) (s/h 1.00).

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By Benjamin Forgey

A critical decade in the history of a great collection

Survey of early years of the famed Phillips Collection gives intimate view of one of nation's most charming settings for art

Marjorie Phillips, at home, with son Laughlin, sits before painting by Bonnard, a family favorite.

The winter of 1896 was a particularly mild one in Washington, D.C. This simple climatic chance eventually led to an otherwise inexplicable happenstance—the founding 22 years later of the Phillips Memorial Gallery in the nation's capital instead of in some other Eastern city with a deeper and longer cultural tradition. The most unusual thing about the Phillips Gallery, known officially since 1961 as the Phillips Collection, is that it was the country's first public institution devoted to the idea of modern art.

This fact, celebrated privately more than once by the many thousands of annual visitors who have come to love the Phillips in the intervening 61 years, is being celebrated publicly with the opening this month of an exhibition, "The Phillips Collection in the Making: 1920-1930." The show, consisting of 37 paintings added to the collection during that fateful decade, was organized jointly by the Phillips and the Smithsonian Institution Traveling Exhibition Service (SITES). The Phillips' permanent collection today includes approximately 2,000 works of art. After its initial five-week stay at its home base in Washington, the exhibit will embark upon an 18-month cross-country tour of other cities: Memphis; Omaha; Dayton, Ohio; Coral Gables; San Antonio; Portland, Oregon; Santa Ana, California; and Allentown, Pennsylvania.

Back in 1896, of course, this unique institution was not even a dream. Its founder, Duncan Phillips, was only ten years old. His parents, Duncan Clinch Phillips and Eliza Laughlin Phillips, having been advised to move south to escape the harsh Pittsburgh winters, were so pleased with the weather in the District of Columbia that year that they looked no farther. They purchased a corner lot in the elegant neighborhood north of Dupont Circle, which was only then beginning to grow, and immediately began to construct the home that to this day houses the Phillips Collection.

Something of the comfortable and rather self-satisfied social air of the capital city at the turn of the century can be gathered from an article on the Phillipses that appeared in the *Washington Post* in 1900. "Few cities in the world offer so many attractions and the pleasant environments for a place of residence as does the national capital," the article began, "and each year its colony of residents is increased with the advent of families of wealth and culture, who, untrammeled by the cares of business or profession, choose this beautiful city in which to spend their winters, or, indeed in many instances, settle upon it as a place of permanent abode. In this category may be mentioned Duncan Clinch Phillips, ex-army officer, and a retired glass manufacturer of Pittsburgh, who came to Washington [permanently] in 1897 and built the beautiful home at 1600 Twenty-first street northwest, which, with his wife and two sons, he now occupies."

Duncan C. Phillips came from a line of military men dating back to the Revolutionary War and before, and

Music room is setting for concerts and art, which here includes Rouault's *Circus Trio,* Monticelli's *As You Like It;* Rouault's *Christ and the High Priest,* de Staël's *Parc de Sceaux,* Rouault's *Verlaine.*

he served throughout the Civil War as a cavalry officer in the Army of the Potomac. After the war he settled into the glass business in Pittsburgh. He married Eliza Laughlin in 1883. Their boys were born soon after, James in 1884 and Duncan in 1886. Mrs. Phillips was the only daughter (she had four brothers) of James Laughlin, one of those strong Scotch-Irish immigrants who helped to transform Pittsburgh from a rowdy river town into a mighty industrial city. Not incidentally, as cofounder of the Jones and Laughlin Steel Company, he was the source of the money his grandson was later to draw upon so rewardingly.

When Duncan Phillips founded his gallery in 1918, it was partly to give purpose to his life after two shattering losses. His father had died in 1917 and, scarcely a year later, his brother Jim succumbed to the Spanish flu. The brothers were raised and educated to privileged independence, and with a patrician sense of social obligation. They were close friends, too, and close in temperament, although Duncan had pursued his early interests in literature and art while Jim had gone into politics and business.

Also, they were copatrons of art. In her 1970 biography, *Duncan Phillips and His Collection,* Phillips' wife Marjorie published a letter from Jim Phillips to his father which skillfully pleaded that "a very small percentage of your annual income and mother's should be regularly laid aside for buying pictures. . . ." The plea was successful, and the brothers immediately began to acquire paintings by contemporary Americans such as Arthur B. Davies and Ernest Lawson.

It was thus that Duncan Phillips positioned himself to participate in one of the more extraordinary adventures in American culture, an adventure born with the Armory Show in 1913, fitfully nurtured during the war years and brought to precarious blossom in the decade following World War I.

In contrast to an earlier, and far wealthier, generation of collectors such as Frick, Mellon, Morgan, the Wideners, the Kresses and many others, which spent its fortunes bringing genuine Old Master paintings to the United States for the first time in great quantity (and they continued to do so through the 1920s and 1930s), a small, more adventuresome group of collectors began to concentrate attention and money upon modern art. Among this group were John Quinn (see SMITHSONIAN, July 1978), Ferdinand Howald, Walter Arensberg, Arthur Jerome Eddy, Katherine S. Dreier, Lizzie P. Bliss, A. E. Gallatin and Dr. Albert C. Barnes. To their pioneering activity, which in each case took on the nature of a personal quest and a passionate commitment to a cause, is due the nucleus of many of the great public collections of modern art in the United States.

Photographs by Robert C. Lautman

Ambience of the Phillips is evident right from foyer where stairwell is hung with works of modern master Oskar Kokoschka: his *Cardinal Della Costa, Courmayeur* and *View of Prague from the River.*

Phillips was something of an anomaly in this group for several reasons. The most ironic of these is that as a young patrician-scholar who had prepared himself "to write about books and literary values" but had discovered he "had more real insight and sympathy for pictorial and decorative art," Phillips had reacted to the Armory Show with a vilifying intensity and incomprehension. He characterized the whole affair as "quite stupefying in its vulgarity," he called Cézanne and Van Gogh "unbalanced fanatics" and he termed Gauguin "half-savage . . . returned altogether to savagery." What matters, of course, is that Phillips had the courage, sensitivity and intelligence to reverse these opinions. In the 1920s he confessed to being embarrassed by some of the "premature judgments" of his youth, but he wrote spiritedly: "To the charge of inconsistency I plead guilty, but it does not trouble my conscience. Consistency from youth to middle age is at best a stiff-necked virtue. Let me be tolerant even of my own early intolerance." Today superb canvases by Cézanne, Van Gogh and Gauguin grace the collection he constructed so carefully over five decades.

The SITES exhibition is both a record of and a tribute to Phillips' growth as a person, collector, critic and educator. Phillips himself catalogued these serious changes not only in the art he and Marjorie selected for the gallery, but in his writing about painters and painting. His mind was led by an intrepid and discerning eye for painting, and the Phillips Collection itself is his more permanent monument. Indeed, its continuing existence is what makes Phillips unique among the early modernist collectors, whose notable acquisitions (except for those of Barnes, in Philadelphia) were dispersed or absorbed by larger institutions.

Unlike any of the others, Phillips conceived of his private collecting activity as an evolutionary, public process from the very beginning. When he announced his intention to form the gallery he asked the rhetorical question: "Why not open the doors to all who would come and watch the building of the edifice—watch the laying of stone upon stone—pass through the portals and share the welcome of art at home, art in its own environment of favorable isolation and intimate contentment?"

If two words were needed to describe the essential appeal of the Phillips Collection, surely Duncan Phillips seized them when he wrote "intimate contentment." The words betray the collector's fond habit of acquiring superb small paintings by the very greatest of artists—a list that would have to start with the wonderful little "painted lyric" by the Venetian master

Benjamin Forgey, an art and architecture critic for the Washington Star, *last wrote about the Corcoran Biennial for* SMITHSONIAN, *February 1979.*

Looking north along 21st Street, N.W., the Phillips building stands at Number 1600; it was begun in 1896.

Giorgione or one of his close followers, a charged wall of little Daumiers, the many pictures haunted by the strange charm of the troubled eccentric Louis M. Eilshemius (see SMITHSONIAN, November 1978), the majestic Chardin still life, and so on. In such a setting even grand paintings are likely to seem serenely reduced in scale, so that one is invited at pleasurable leisure to investigate each delectable inch of a painting such as Renoir's *Luncheon of the Boating Party* (as Phillips was to write of the picture, *"Every inch of canvas is alive* and worth framing for itself)."

The art works seem destined to enjoy themselves in the Phillips Collection. So, too, do the viewers, quietly and immensely. By 1930 the family felt constrained by the accumulation of art to move out of the red brick mansion on 21st Street, an eclectic palimpsest of architectural styles and additions that still seems like a home. Today one still feels *invited* into the place by the mixture of art, dark turn-of-the-century wood paneling, furniture and rugs by now grown comfortably shabby (though perhaps *too* shabby) and, not least, by the comfortably inconspicuous presence of the staff itself. Even today the "guard" one sees sitting casually with the art in the Phillips is more than likely an artist, as well.

One thing not clear in the special exhibition of 37 paintings by 37 different painters, but clear enough inside the Phillips Collection itself, is Duncan's idea of assembling what he called "units" of pictures by a single artist. Outstanding among the Phillips "units" is its incomparable roomful of pictures by Pierre Bonnard, while a most endearing such assembly is the "Klee Room," a tiny cubicle that is vastly enlarged by the poignant, witty, asymmetrical music of that 20th-century Swiss master. It is hardly surprising that it was Phillips who first conceived the idea of grouping

Intimate rooms add special flavor to the Collection. Ryder's *MacBeth and the Witches* is flanked by three other Ryders. Below, Degas' *Dancers at the Bar;* a Boudin, far left; and Berthe Morisot's *Two Girls.*

several luminous color abstractions by Mark Rothko in a single room—in effect, the first Rothko Chapel.

Duncan Phillips and his brother began collecting by acquiring paintings by relatively conservative, although independent, contemporary American artists—painters such as Julian Alden Weir, who combined the American landscape tradition with elements of French Impressionism, or Arthur B. Davies, who took his cue (and then went his own idiosyncratic way) from fin-de-siècle Symbolism. Duncan rejected his early nationalistic bias in favor of an international idea of art. However, he did not give up his allegiance to what he considered the best in contemporary American art.

Client, supporter and friend

Far from it: he was a passionate supporter of the artists he believed in. For some, such as the lonely independent, Arthur G. Dove, this support (along with that of Alfred Stieglitz) was not just life enhancing, it was essential. Although, surprisingly, the artist and the collector met face-to-face only once, Phillips was a true patron to Dove. His support consisted not only of purchases (a total of 53 canvases) but, equally as important, of letters of encouragement, advice and friendship, as well as prestigious exhibitions and published criticism of the caliber that American artists rarely received in those days. Equally telling is Phillips' support of Augustus Vincent Tack, a portrait painter and devout Catholic who "also" painted mystical abstractions at a very early date. Phillips was, almost literally, Tack's sole client for these paintings and only today are art historians and other museums beginning to catch up.

The most moving tribute to this aspect of Phillips' activity, recorded in Bess Hormats' excellent essay in the catalog to the SITES exhibition, was written by the great Alfred Stieglitz not long before his death in 1945: "Without you and Mrs. Phillips I could not have achieved much of what exists today in the form of An American Place [his celebrated groundbreaking New York Gallery]."

From its relatively narrow beginnings, Phillips' taste expanded at a speedy clip during the 1920s and, as it did so, he and Marjorie began to buy increasingly important paintings in Europe. Undoubtedly the greatest single event in the development of this taste, and also in making the art public take note of what the Phillipses were doing down in Washington, was their dramatic acquisition in 1923 of Renoir's already famous picture, *The Luncheon of the Boating Party.* The price was $125,000, the highest they ever paid for a painting, and the price alone was much heralded in the American press.

Like all great museums, the Phillips Collection is

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a place of stimulating comparisons. If there is a special quality to the challenge of comparing pictures at the Phillips, however, it resides in the almost palpable feeling one gets that each single object has been scrutinized with such knowledgeable passion by a single collector. Phillips was known as a slow decider, and he would ponder a painting for months or even years before giving it a final "yes" or "no." Indeed, one of the fine scholarly points in the SITES catalog is an appendix that traces some of the comings and goings of paintings as Phillips constantly refined and improved his collection—a Gauguin painting "sent to Newhouse Gallery in part trade for Goya's *St. Peter Repentant,*" a Twachtman "sent to Scott and Fowles in part trade for Daumier's *Fireworks,*" a Ryder traded for a (presumably) better Ryder, a Van Gogh for another Van Gogh and so on, in fascinating detail.

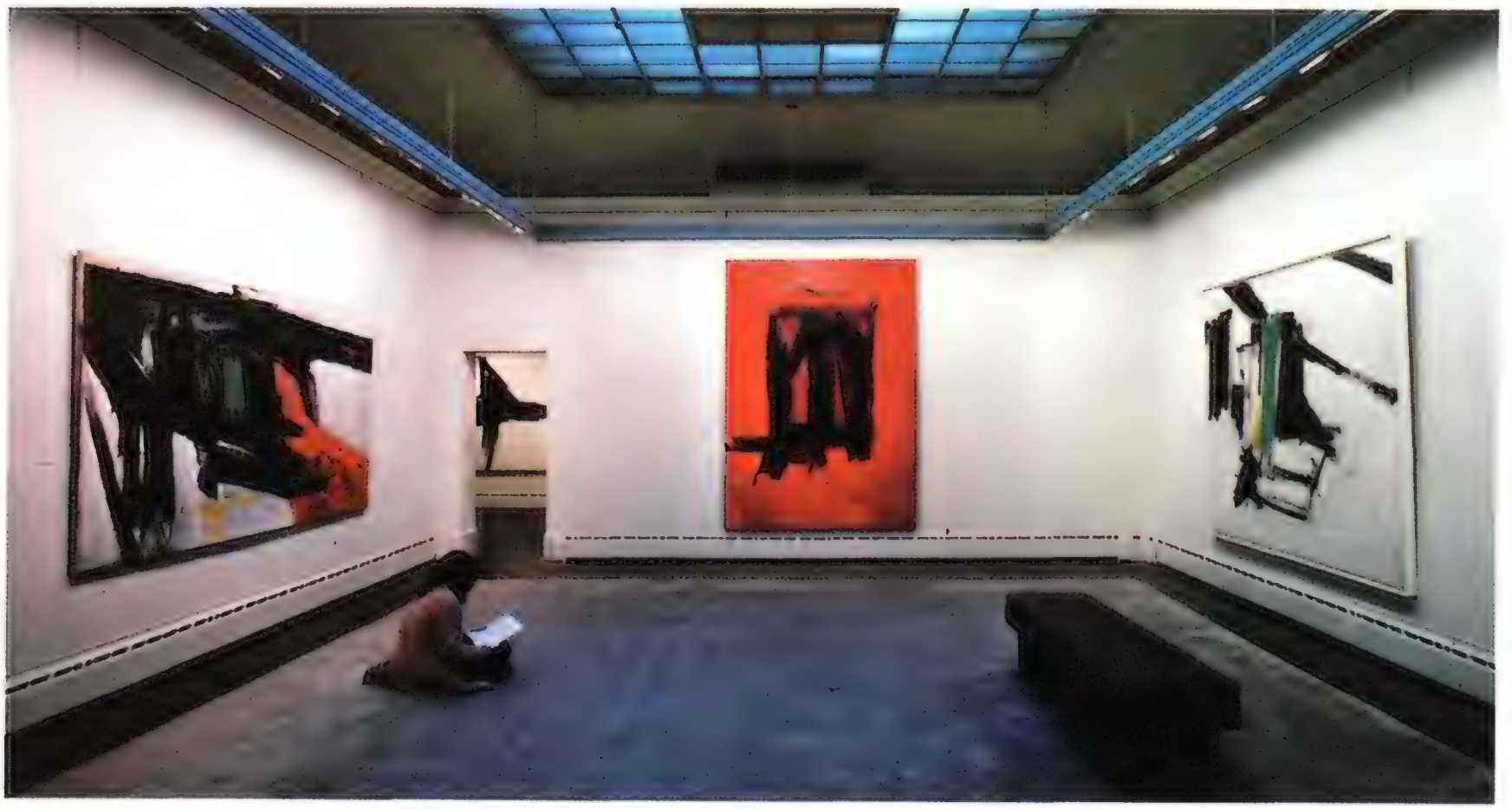
Phillips' taste was consistent, but eclectic. He gave his gallery a subtitle, "A Museum of Modern Art and Its Sources," which suggests his evolutionary idea of modern art. As he explained unassumingly in the preface to his 1952 catalog of the collection, "I only venture to say which of these [modern paintings] I like well enough and consider sound, sincere and original enough to purchase and to exhibit as evidences of new life springing up from old roots. . . ."

This alone explains the presence in a mainly modern collection of such Old Masters as El Greco and Goya, two of his "heroes of evolutionary progress in art."

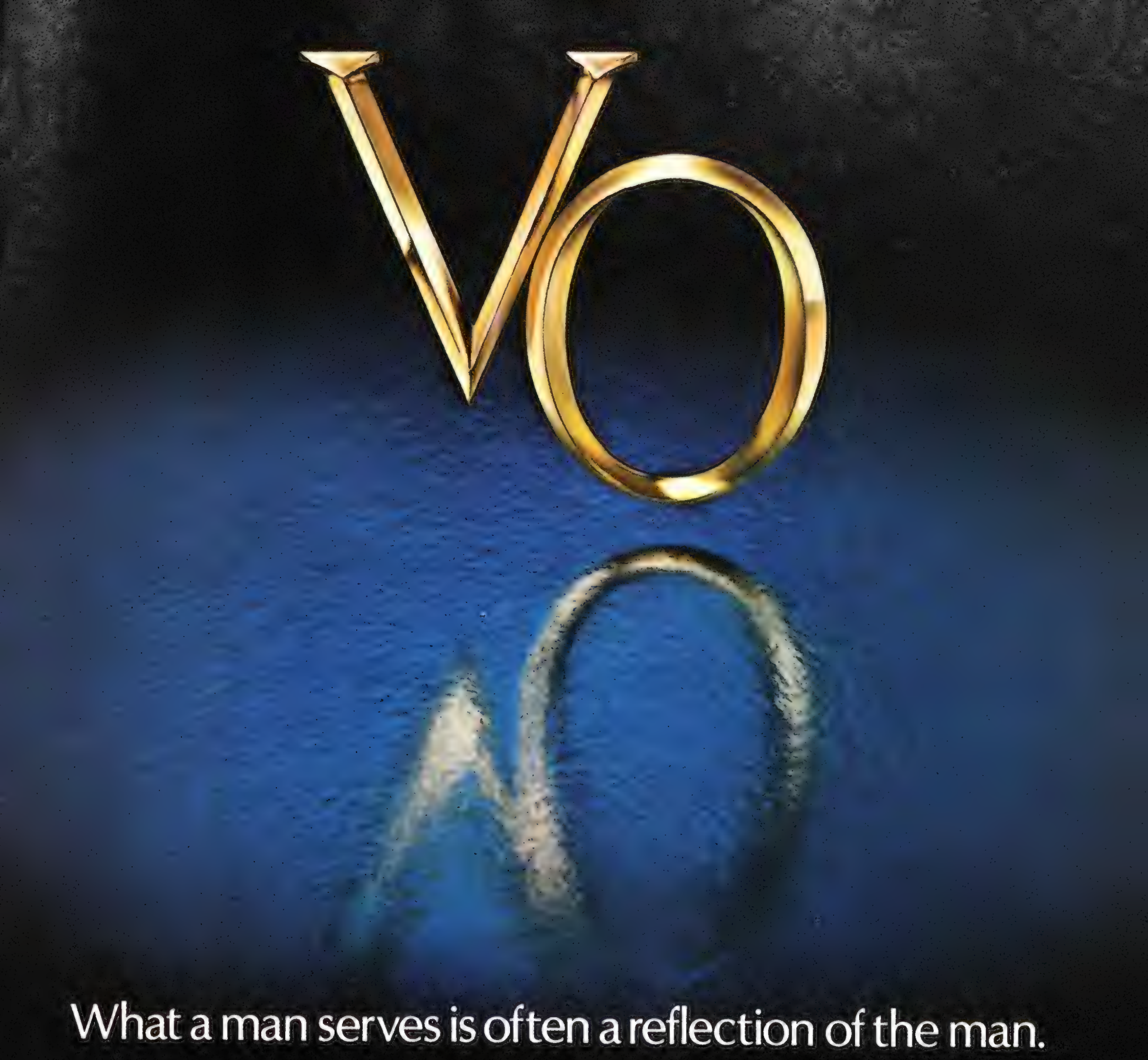
In the end it is this constant, probing presence of Duncan Phillips' mind and eye—his taste—that makes the Phillips Collection great. It is a sensibility more clearly felt than easily put into words, although the American painter and critic Guy Pène du Bois made a game summary when he saw in the collection "a definite expression of the character of the collector."

Phillips responded with pellucid feeling to color, the most emotive of all values in paintings, and yet was pulled back from extravagance by the counterbalancing force of a certain classical repose in composition, so that the poles of his taste can be clearly seen in the example of two of the great Phillips "units" —Bonnard and Braque, the one a case of almost fiery luminescence of color saved by in-built subtlety, the other of a serene order inhabited by intense feeling.

When Duncan Phillips died in 1966 he provided instructions for the continuation of the collection; Marjorie Phillips, the painter in the family, became director and Laughlin Phillips, the son, became president. The story of Phillips' talented and beautiful wife (née Marjorie Acker) is a separate one in a way, but much of her character and her modesty is told in the opening and closing sentences of her book: "Duncan Phillips and I met in the most delightful way," and "The collection which is now on its own will always be alive with Duncan's spirit."



Special exhibition of Franz Kline's work in color is handsomely displayed in modern wing galleries; from left, *Orange and Black Wall;* through door, *Green Cross;* center, *Red Painting;* and *De Medici.*



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Laughlin Phillips, whose natural, youthful reluctance to follow the awesome footsteps of his father has gradually given way, took over as director when his mother stepped down in 1972. Even so, as editor of *The Washingtonian,* a magazine he founded in 1965, he was able to spend only half time at the Phillips job until two months ago, when he sold the magazine.

This step came none too soon, for the collection has enormous, pressing needs—"Almost too many," as he said— for conservation of the paintings, new and better storage space, restored spaces inside, new scholarly attention and, most of all, new sources of capital and operating funds. The Phillips Collection, on its own in the competitive world of modern museums with their boundless new demands, has simply outgrown the $3-million endowment Duncan Phillips provided for it. Fortunately, Laughlin Phillips is more aware of these problems than anyone. "The trick will be to do something without changing the essential character of the place," he observed, "without taking away its simplicity and informality."

And then, there obviously *is* continuing life in the venerable place, now an institution. Just last February the Phillips mounted a major exhibition of works by Franz Kline, the Abstract Expressionist painter whose talents as a colorist have been all but denied by the reputation accorded his powerful black-and-white canvases. Fittingly, the Phillips presented Franz Kline with a difference: every single work in the show was painted with colors.

Juxtaposition of world masterpieces is outstanding at the Collection. From left: El Greco's *Repentant Peter,* Corot's *View of Genzano,* Goya's *St. Peter Repentant,* Delacroix's *Horses Coming Out of the Sea.*

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Nothing Even Comes Close

Missing a solar wing (sheared off during launch), shaded from sun by makeshift "parasol" attached by astronauts in space, Skylab drifts above atmosphere. Windmill-like solar collectors power its observatory.

By Everly Driscoll

Skylab nears its reentry from orbit in a race with time and the sun

Space engineers succeeded in working miracles to control the derelict satellite in orbit, but hold their breaths about plunge to Earth

After orbiting the Earth more than 31,000 times, the 79-ton Skylab—America's first space station—will soon fall. The flight controllers who follow its path will not know when or where the huge space lab will come down until shortly before it happens—and even then Skylab may hit the dense upper atmosphere and skip back out the way a properly thrown stone skips across a pond's surface. It may wobble and bob about before reentry, but when it does come down, breaking apart as it falls, the debris that does not burn up will leave a "footprint" several thousand miles long and a hundred miles wide—somewhere.

At the time Skylab was launched, in mid-May 1973, James C. Fletcher, administrator of the National Aeronautics and Space Administration, felt the risk of its debris coming down over a populated area was small enough to live with. It was his decision, and it wasn't an easy one.

When he became head of NASA in April 1971, a decision to launch Skylab without any way to control its reentry had already been made. Acting administrator George M. Low and manned space-flight chief Dale D. Myers had spent more than a year examining the potential hazard from Skylab's debris and what, if anything, could be done to minimize it—schemes such as adding "deboost" rockets to various parts of the space station so that their reentry could be aimed toward the oceans. But the costs and unknown delays to the launch were unacceptable at a time when tight budgets created yearly uncertainties about how to proceed most efficiently in exploring the unknown.

In the fall of 1970 Myers recommended to Low that NASA live with the risk: one chance in 55 that the reentering objects would harm anyone out of the Earth's population. This risk, he said, was only a tenth as great as that from all space hardware reentering the atmosphere during Skylab's lifetime. In early April 1971, Low concurred with the recommendation, but later that month Fletcher took over. He thought the risk was too high, and asked Low to review the options. After more study, engineers at Alabama's G. C. Marshall Space Flight Center devised a scheme to eliminate a large part of the hazard—that from the three S-IVB rockets which would launch astronauts to Skylab—by using leftover fuel to aim the rockets down to the oceans. A new analysis in May 1973 reduced the odds of a casualty to about one in 120. Fletcher gave his approval and Skylab was launched that month—exactly six years ago.

But Fletcher was also there when the first piece of debris—the 79,000-pound Saturn-II rocket which had launched Skylab—came down early in 1975. And he still recalls that tight, nauseated sensation in his stomach as he awaited the S-II's plunge to Earth.

NORAD, the North American Air Defense Command (which keeps track of the thousands of orbiting spacecraft, boosters and pieces in order to distinguish them from incoming missiles), predicted the rocket would fall sometime between December 29, 1974, and January 10, 1975. Fletcher set up a "command watch" at NASA's Washington headquarters and asked an assistant, General Duward L. Crow, to keep him apprised of NORAD's latest predictions of the reentry date. In the unlikely event the S-II fell on people or buildings, NASA had an investigative team, with passports in hand, ready to fly to the crash scene.

NORAD revised its predictions twice daily as the critical time neared in an attempt to narrow the reentry time and place. Knowing what to expect but

Everly Driscoll, a former aerospace editor for Science News, *is a Washington free-lance writer working on a book about the history of the U.S. space program.*

Illustrations by Pierre Mion

not where or when to expect it galled Fletcher as the one or two days of anxiety he anticipated turned into a two-week ordeal of tension and suspense.

NORAD's last predictions came in the predawn hours of January 11. At about 1 A.M. Crow was told that the S-II could reenter over Los Angeles on its next orbit, scattering debris eastward. But it stayed up. The next pass was also over America's heavily populated Northeastern states. But again nothing happened, over land. Only later that day, when NORAD verified that the rocket had indeed disappeared from view of its tracking network on that pass, did Fletcher know for sure the S-II was down somewhere. An airline pilot reported seeing a flash of light south of the Azores that looked like a reentry. It was probably the S-II.

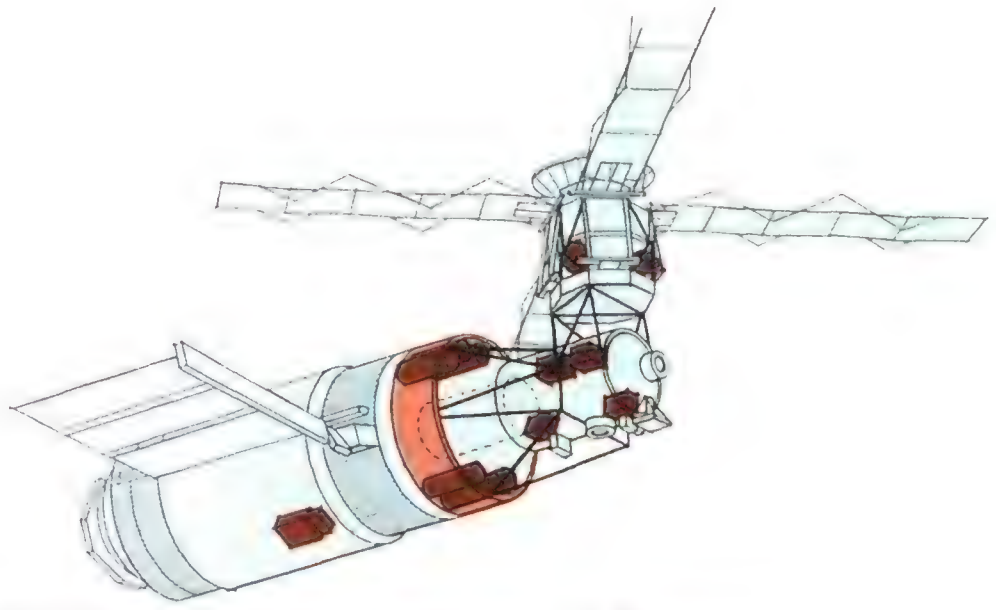
Between February and August 1975, Skylab's four 6,000-pound payload shroud panels also reentered; only one of them, however, fell on land, somewhere in south central Africa.

Fletcher never wanted to endure such a nerve-racking experience again—but the unwieldy Skylab was still aloft, its workshop, airlock and instrument unit, docking module and solar observatory constituting the largest, heaviest (157,700 pounds) satellite in orbit. On the chance that its reentry could still somehow be controlled, Fletcher launched yet another review of the options left, focusing on use of the future space shuttle (SMITHSONIAN, May 1977) to reboost or deboost the lab. The shuttle was scheduled for the first of its four test flights in the spring of 1979. Such an operation would require only minimal reactivation of some Skylab systems, if any. No one could be sure what the lab's condition would be by then.

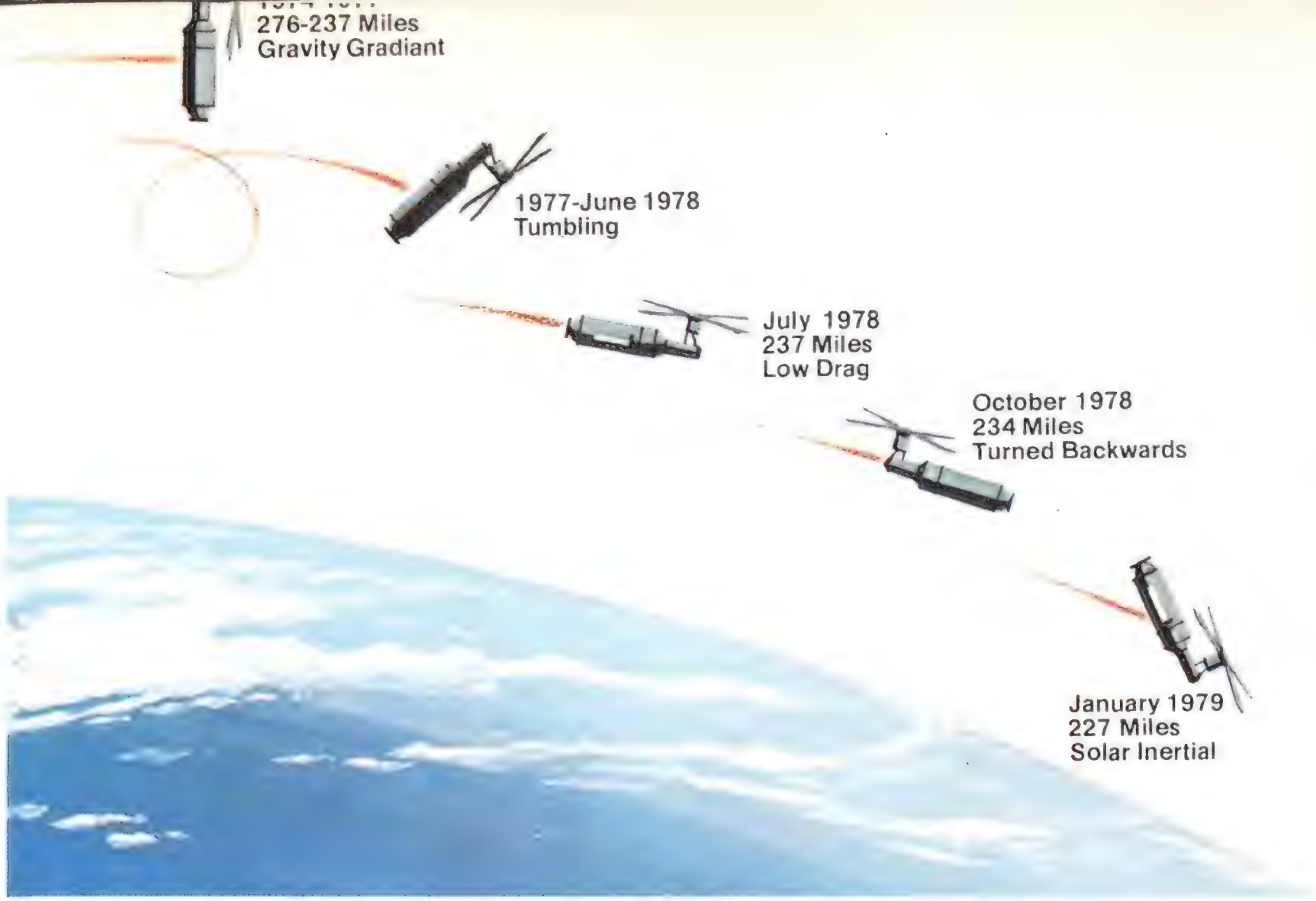
Skylab had been designed to last only a limited time in orbit. It was built mostly from "off-the-shelf" hardware left over from the Apollo space program when three moon-landing missions were canceled. Even from the beginning, Skylab mishaps and malfunctions taxed the ingenuity of astronauts and engineers—in midst of a tight schedule of scientific observations and experiments including studies of Man's physiology in space, of Earth's land and oceans, and investigations of the sun and other stars.

Yet the station proved a comfortable home above Earth, a three-story structure with kitchen, sleeping bins and experiment areas. Jack R. Lousma, one of the nine astronauts who spent time in Skylab, remembers the warm sensation that flooded him as he first entered the space house. He felt he was in a cabin in the wilderness, one unoccupied a long time. He also remembers with a smile the last meeting on Earth with solar scientists. "Don't expect too much activity from the sun," they had cautioned. Yet shortly after Lousma arrived at the station, the solar alarm signaled that the sun had begun to flare. And there was seldom a day when the sun was quiet. The sun belched off gigantic clouds of hot gas traveling at speeds of more than a million miles an hour, and sprouted sunspots (the major barometer of solar activity) amidst blotchy regions where magnetic fields looped like spaghetti strands over the surface. An increase in sunspots was a sign that the Earth's upper atmosphere was heating up and expanding. This would exert an added "drag" on orbiting spacecraft.

For mysterious reasons, the sun goes through irregular cycles (averaging 11 years), starting from a relatively quiet, inactive period, called sunspot minimum, then building up to an active sunspot maximum. Right now we are nearing the maximum of the sunspot cycle but, when Skylab flew, the sun should have been running down from a 1968 sunspot maximum.



Most of reentering Skylab will burn up, but parts falling to Earth intact (in red) will include its cylindrical 5,000-pound airlock shroud, and smaller oxygen tanks, film vaults and gyroscope wheels.



Left adrift in 1974, Skylab lost altitude slowly until it began tumbling in 1977. In 1978 it was maneuvered to minimize atmospheric drag. When rescue plan was abandoned, lab was reoriented to hasten reentry.

The next minimum was expected to take place in 1975.

The astronauts spent hundreds of hours at the solar observatory where two TV screens, surrounded by control panels, revealed the view of the sun seen by the telescopes outside. To Lousma the sun looked as if it were "breaking at the seams, like a football kicked around the street a lot." He had no way of knowing then that Skylab would one day fall prey to that unpredictable star.

The last crew closed the orbiting outpost in early February 1974. NASA never intended to occupy the station again, but Skylab manager William C. Schneider ordered its switches left "on," just in case, as one flight controller quipped, "astronauts, cosmonauts or little green men" might one day want to contact it. Then, firing the Apollo's small thrusters, the astronauts boosted Skylab as far as they could—about seven miles—to an altitude of about 273 statute miles, where NASA calculated it should be safe from reentry until 1983. Within ten months, however, Marshall Space Flight engineers, using NORAD's radar-tracking data, recalculated Skylab's "ballistic coefficient"—a formula for area, mass and aerodynamic drag—from which reentry could be predicted. Because of solar activity, the drag was indeed greater than predicted, and Marshall estimated that Skylab would reenter in 1980 rather than 1983. At the time, no one paid much attention to the new data; the decision had already been made to live with the risk.

It was time to move on to other things. After U.S. astronauts and Soviet cosmonauts had held their historic rendezvous in August 1975, NASA disposed of the last hardware remaining from the moon-landing program (a backup orbital Skylab workshop, for example, was put on display at the Smithsonian's National Air and Space Museum). The five Skylab tracking stations, scattered around the globe, were stripped to bare bones. Disassembled equipment was stored or sold. Finally, the launch stands for the Apollo rockets were modified for the space shuttle. By 1976 there was no way to launch men to reboost Skylab to a higher orbit or aim it to an ocean reentry. NASA had crossed a bridge in the history of manned space flight, and burned it. But the shuttle was expected to be ready in 1979, in time to get to Skylab if NASA still wanted to.

The sunspot cycle was still not behaving: the sunspot number kept bobbing up and down for months. But by mid-1977 the sunspot number had clearly begun to rise again, leaving scientists unsure of which month to pinpoint as the actual 1976 minimum.

To predict when Skylab would come down, scientists had to estimate the rate at which sunspots in-

creased from minimum in order to predict the time and magnitude of sunspots at maximum. But exact prediction of future sunspot activity is at best as much an art as a science, and predictions for the next maximum would have varied—even if scientists hadn't chosen different months as the minimum.

By 1978 there were about 20 different predictions for sunspot numbers at the peak of the new cycle and the uncertainty could mean a difference of months in Skylab's life, which once led solar scientist John A. Eddy, of the Smithsonian Astrophysical Observatory, to observe that "if your electrocardiogram looked like the solar cycle, you'd be a worried person."

At NASA headquarters, Skylab's reentry became the burden of Fletcher's successor—and the present NASA chief—Robert A. Frosch. Frosch's first reaction to Skylab had been similar to Chicken Little's: "Goodness gracious, the sky is falling! I must go and tell the king!" Well, maybe not the king, but maybe the king's science adviser. Frosch knew that thousands of pieces of spaceware had already reentered the atmosphere and caused no injuries; that from 55,000 to 300,000 pounds of meteorite fragments—rocks and stones from space—hit Earth's surface yearly, sometimes landing on rooftops of barns and houses but mostly in remote regions; and that in the past 200 years no more than seven people had been injured by meteorites. Nevertheless, he just did not like the idea of something coming down out of orbit—something put up there by NASA—if anything reasonable could be done to prevent it. Frosch asked his colleagues for a review of the options, such as maneuvering units, carried in either existing unmanned rockets or the shuttle, to boost or deboost Skylab. Apollo-11 astronaut Edwin E. "Buzz" Aldrin jr. came up with the idea of a lasso attached to the shuttle and Skylab, allowing centrifugal force to sling the lab to a higher orbit. It was a possible solution, but one that NASA considered too dangerous.

A committee recommended in October 1977, and Frosch contracted for, a reusable Teleoperator Retrieval System (TRS), a booster that could be controlled remotely by TV from inside the shuttle. The Skylab "rescue" mission was scheduled for the third space shuttle flight, but in January 1978 the Soviet's Cosmos 954 reentered, carrying a radioactive power source that was scattered over the icy reaches of northwest Canada. Hard questions were then asked about Skylab and other U.S. space debris, even though Skylab had no significant radioactive material on board. Congress asked if the Skylab rescue could be moved up to the second shuttle test flight. It was.

The shuttle program, however, was falling behind schedule at the same time that scientists were producing their perplexing array of predictions as to how soon Skylab would come down. Frosch, contemplating the sunspot forecasts, quipped he preferred the Roman method—haruspicy—for predicting the future: reading the entrails of chickens.

To compound NASA's problems, NORAD had noticed Skylab doing funny things: it was losing altitude faster than previously, probably tumbling in orbit. If NASA didn't act quickly, there would be no Skylab to save with the shuttle and TRS.

"A proposition you cannot refuse"

At the Marshall Space Flight Center in Alabama, Herman E. Thomason, the 52-year-old chief of the engineering lab, had been urging action on Skylab for some time. Thomason, whose PhD thesis in 1969 had been on controlling Skylab, was an inveterate tinkerer, a man with his head immersed in space and his feet planted part-time on his cattle-soybean farm.

His call to Skylab action came in February 1978. As usual when talking on the phone, Thomason looked out his window at the distant trees and paced a well-trod path around his desk. "Are you sitting down?" his boss asked. "I have a proposition you cannot refuse." Thomason sat down. He was asked to check out Skylab's systems, and to place it in an orientation that would reduce its drag and delay its fall—maybe buying a couple of months in orbit. He would have four weeks to form a team and research the Skylab systems before going to Bermuda, the only remaining ground-tracking station with equipment to transmit at the lab's radio frequencies.

Thomason agreed he could check out Skylab—if the sleeping giant weren't dead; if the solar panels still supplied power; if the batteries would still take a charge; if the communications system, and all its switches, worked; if there was enough nitrogen-gas propellant remaining to maneuver the station; if the

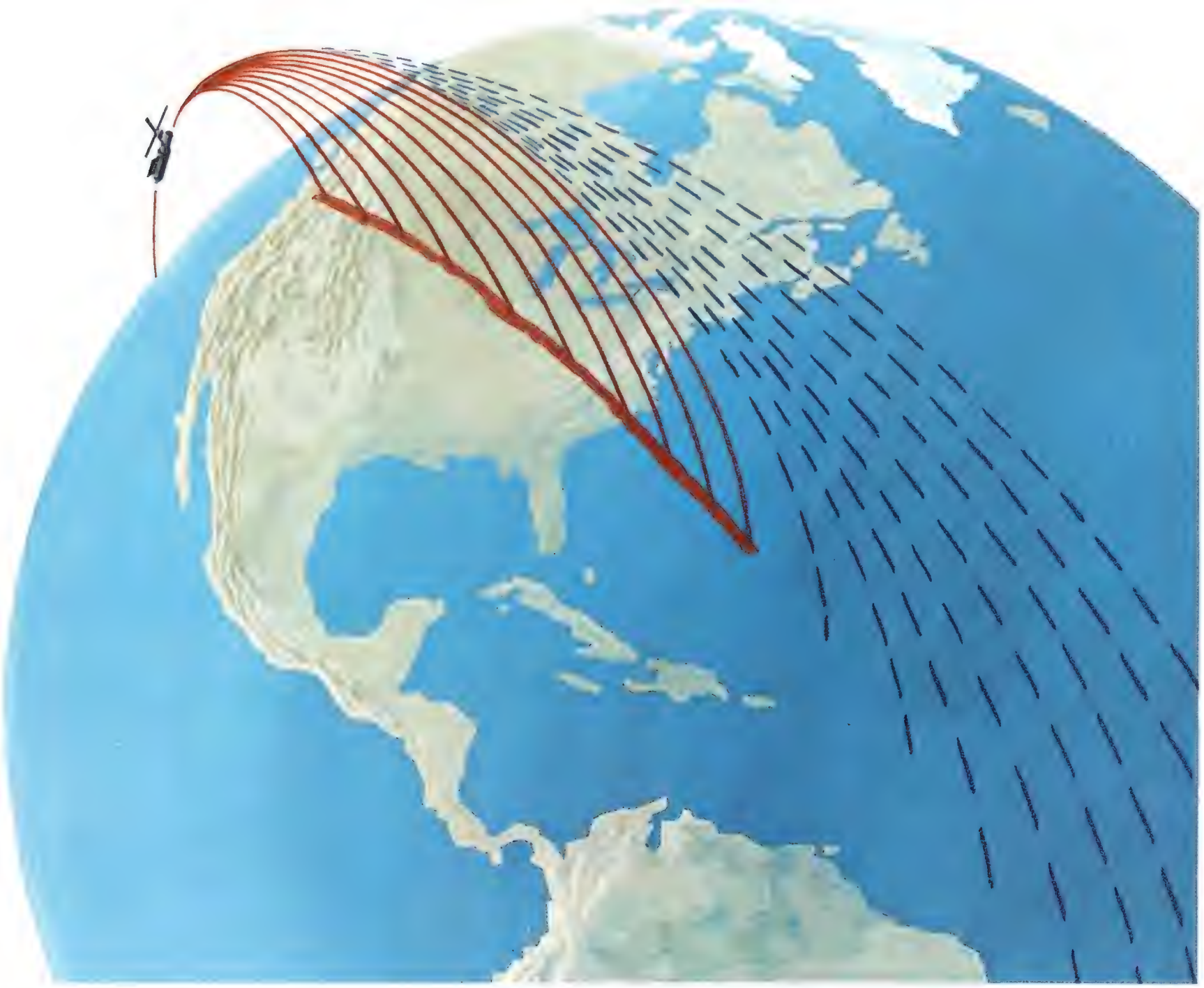
bearings in the two-remaining control gyroscopes, the 250-pound wheels, weren't worn out (one had failed during Skylab's manned phase). Hardly anyone thought Skylab could be reawakened. But Thomason thought there was a possibility.

There was, as yet, no Skylab mission control at the L. B. Johnson Space Center in Houston. The Apollo/Skylab control room was being modified for the shuttle. There were no flight controllers; those who had not moved on to other jobs outside NASA were deep into training for the shuttle. There was no communication network available for 24-hour-a-day interrogation and communication.

Where were the Skylab manuals, the thousands of pages of documentation, specifying the station's every circuit and system? They were buried in archives, stored in dusty file cabinets. Thomason could retrieve the paper, but not the minds. The full Skylab team was scattered but, he discovered, a few engineers who had once worked on Skylab were still around.

Thomason found the most vital information with people who still had files in their desks or knew where they were hidden. He contacted Skylab contractors, such as McDonnell Douglas, Martin Marietta and IBM, and formed a team (Hans F. Kennel, William B. Chubb, Billy M. Adair, Robert E. Kapustka, William L. Peters, Jimmy S. McLendon), pulling the men off future programs for a voyage into the past.

The chances were slim, perhaps nonexistent, that Skylab would respond, but Thomason and his team



Path of Skylab's reentry will leave a 4,000-mile-long "footprint" of debris (solid lines) somewhere on Earth. There is a 75-percent chance that debris will fall over oceans, but if reentry appears aimed at land, one plan calls for last-minute firing of Skylab thrusters to alter reentry (dotted lines), sending debris to ocean.

Artist's conception of reentry shows Skylab at 66 miles above Earth, beginning to disintegrate and burn.

of optimists made their way to Bermuda in early March 1978 to explore the possibility. Overhead in orbit about Earth then were 6,174 objects (whole spacecraft, pieces and boosters); the men would try to contact one of them before it became a statistic such as the 1,533 U.S. space pieces, or the 4,563 Soviet pieces, or the 78 other-nation objects which had already re-entered the atmosphere.

On March 6, Skylab passed over the tracking station twice a day, within communication range for nine to ten minutes each pass. The team had found the code word, the numbers to transmit at a given frequency, which meant, "Skylab, how are you?" As the lab appeared over the tracking system, the men began sending the command continuously in the blind. They waited an eternity in the silence of 39 seconds.

Thomason would always have difficulty believing what happened next. For one minute, 58 seconds, Skylab answered. In engineering jargon it reported, "I'm fine, temperatures inside are 57 degrees."

"We have found the needle in the sky," Thomason thought to himself.

The lab reported inventories of oxygen, nitrogen and cooling fluid, pressure levels, currents and so on. Then suddenly it stopped dead.

The men, at first overjoyed, were stunned. "We've done something wrong, we've killed it," Thomason thought. But what had gone wrong? The beseeching command was sent again. A few minutes later Skylab answered, but it relayed only the "hum" of the communication carrier, much like the dial tone on a phone. There was no "voice" or modulation containing data on the hum. Then there was silence again. On the next pass, the team tried again, with the same response. By the second day the men knew there could be only one explanation: Skylab was rolling. Only when the solar panels were in the sunlight was there power to transmit. Skylab's on-board tape recorder was plugged to another power supply and when the command was sent, data stored since 1974 began to be transmitted to Earth. Skylab was responding again.

The most important power system, however, was in the solar observatory. That system powered Skylab's computers, which, in turn, controlled its two maneuvering systems—the 250-pound control gyroscopes used to transfer angular momentum to the lab when a position change was required, and the nitrogen-driven thrusters for attitude control, called TACS.

Unfortunately, the 18 observatory batteries had a low-voltage cutoff. If they were commanded "on" and sensed low voltage, they immediately commanded themselves off. Time was needed to plot a course around this problem. But in the interim, power could be transferred from the airlock batteries to check the computers outside on the solar observatory in the frigid cold of space.

The command was sent. The computer responded,

Lighter pieces—solar panels and Apollo telescope mount—are torn off as Mylar sunshade is ripped away.

"I'm fine." It also reported, however, that Skylab was not only rolling about its long axis; its nose and tail were bobbing up and down and around in a motion that, if traced on paper, would resemble a rose petal.

On March 14 the team left Bermuda, relieved, but also anxious about next steps. Three days later, Jack Lousma and Fred W. Haise jr., veteran of the aborted Apollo-13 mission, were selected as pilot and commander of the second shuttle test flight. The teleoperated booster was already in the works as leftover systems from the Mars/Viking spacecraft were dusted off and modified for Skylab's rescue. But the shuttle itself was in trouble. Engine tests were going badly, and the timetable for reaching the lab was stretching out. Estimates slipped from October to December 1979, or still later.

In the following months the astronauts trained intensively. Lousma practiced flying and docking the TRS booster in a simulator, even before the actual device was built. And Thomason's team of flight controllers overcame a host of problems to recapture Skylab and slow its fall.

In 1974 Skylab had been left at an altitude of 273 statute miles. By February 1978 it had dropped to 253 miles, by March to 251 miles, and in April it began rolling faster and thus dropping faster. And so the second contact with Skylab on April 23 began with a sense of urgency. The team found a way to counteract the low-voltage cutoff on the 18 observatory batteries—sending continuous commands "on." To charge one battery with 26 volts the command had to be sent continuously for 575 seconds; to charge all of them took days because the team communicated only a few passes a day with Skylab. Nights were spent writing the new computer program to control Skylab and determining how to integrate it with the old one on board—"cuttin', stitchin' and patchin'," as Thomason put it. By the end of May, Skylab systems were looking good; the impossible seemed feasible. With tracking stations reactivated and flight controllers trained, Skylab could be controlled constantly.

The engineers take a gamble

On June 8 the men prepared to test the one remaining critical system—the 250-pound wheel gyroscopes. Before the gyros could be used for maneuvering Skylab, they would have to be spun-up to 9,000 rpm. Large amounts of power would be needed—large enough to drain Skylab practically empty. The team decided to gamble: to save power they turned off the computer. It was risky, but worked. After 11 hours the gyros were spinning at the required rate. In addition, Skylab had 18,000 pound-seconds of nitrogen propellant for the June 9 maneuvers, when the men would try to "capture" the ungainly lab.

They knew Skylab was rolling, its nose and tail bobbing around, but not how it was oriented. To control it, they would use two sun sensors oriented like an "L." When both were fully exposed to the sun, they would stop the lab's motion in a position called "solar inertial." From there they would attempt to maneuver it to the low, or minimum, drag position. On June 9, with eyes on the sun sensors' telemetry and hands on the controls to fire the nitrogen thrusters, the team waited. The moment the sun appeared in one sensor, the thrusters were fired. Skylab stopped rolling. When the lab had been oriented further to stop its bobbing and wavering, the men discovered it was flying backward, tail first in the direction of flight. They commanded an 180-degree flip. Skylab obeyed. It was in complete control.

One step remained: to feed the orientation into the second computer in case the first failed. They sent the command. Then the bottom fell out. A spurious signal

in the command turned off controls to the large gyros, and Skylab, programmed to maintain its position, automatically fired its nitrogen thrusters, wasting scarce fuel. The problem was solved on the next pass.

It wasn't the last time Skylab slipped its traces. At one point, flight controllers lost all contact with it when someone forgot to watch the lab's batteries and they tripped off. The team had to start all over again, charging the batteries, spinning-up the gyros, recapturing and flipping the lab again. But by July 1978 Skylab was stabilized in a low-drag orientation.

By January 1979, it orbited at 227 statute miles altitude, having dropped only 24 miles since the first communications in March, and only ten miles since it had been stabilized for the last time in July.

"We are in Fat City," Thomason thought.

By then, however, predictions based on sunspot activity indicated that Skylab would probably reach the critical altitude of 173 statute miles—too low to reboost it—in February or March 1980, at about sunspot maximum. And further delays in the shuttle schedule had pushed the Skylab rescue to the same time. The race was down to the wire, and any new delays could deal a fatal blow. Was it worth it to continue?

John Yardley, chief of manned spaceflight, concluded "no." When there was a chance of reusing Skylab, the future had looked different. But if Skylab were reboosted 70 miles—the limit the TRS could heave the station—Skylab would eventually have to be reboosted yet again, and he doubted the lab would remain stable for that long. Yardley recommended that the program be abandoned and Frosch sent the recommendations to the President last December.

After a White House decision, NASA announced there would be no Skylab rescue. The TRS development was halted. Thomason was asked to maneuver Skylab into a position that would bring it down months earlier, to get the ordeal over with. Once again, NASA had decided to live with the risk.

NORAD's predictions of Skylab's reentry will begin about 20 days prior to the event, increasing in frequency as the projected reentry date nears. Updates of Skylab's status will come four times daily near the end. NORAD will attempt, as it did with the S-II, to pinpoint the orbit or orbits of reentry. The final prediction should come two hours in advance.

Skylab will reenter at about 66 miles altitude. At 58 miles, the solar observatory will tear off the station, and at 50 miles all the telescopes and equipment will come out. The multiple-docking adapter will begin to melt. At 48 miles, the docking adapter will be ripped off the station; at 47 miles its equipment will come out. At 46 miles, the workshop itself, the old Saturn S-IVB tank, will begin to disintegrate.

Of the 157,700 pounds reentering, NASA estimates some 40,000 to 50,000 pounds will survive as 400 to 500 individual pieces weighing between a pound and several thousand pounds. These will be dispersed along a ground track 4,000 miles long and about 100 miles wide (p. 85). The largest intact pieces could be the 5,000-pound airlock shroud and the 4,000-pound vault used for film storage. But even if Skylab should head for a city, Yardley estimates that "we only expect to get one or two of these 400 pieces" because of their widely dispersed density.

The odds of anyone being injured from this fallout are very small—less than one chance in 150. But, as James Fletcher reflected when the S-II reentered six years ago, if NORAD narrows reentry to one or two orbits that are over heavily populated terrain, the odds go up significantly.

Herman Thomason, however, is still trying to defy the odds. Prior to Skylab's reentry, the ever-optimistic Marshall-Johnson team may be able, he thinks, to pull off one last miracle. By changing Skylab's computer program yet again, the team could control the location of the lab over Earth's surface at the moment it begins to burn and disintegrate, thereby making certain the pieces land in the oceans during the 20-minute fallout. He would use the precious 7,782 pound-seconds of fuel he's been hoarding to avert a reentry over land. Many doubt such a scheme will work. Others fear any tinkering at all will make NASA more culpable in case of a mishap. But if anyone can do it, Thomason's team can.

At about 4,000 feet above Earth, Skylab's airlock shroud and oxygen cylinders fall toward the surface. But the odds are small that any debris will hit land; chances of casualty are fewer than one in 150.

Bitch Kitty, here ten months old, was a favorite of wolf researchers on Isle Royale. The foxes that lived around the cabin became relatively tame from being fed at the camp and the lodge in summer.

Two males roll on ground in a real fight to settle a dominance question. Most such problems are resolved by stereotyped behavior, but occasionally challenge is serious enough to result in open combat, as here.

Article and photographs by Durward L. Allen

Lives and loves of some sly foxes on Isle Royale

Winter after winter, scientists charted evolving relationships in these lake-locked animals—and became attached to them

A professor of wildlife ecology at Purdue University, Durward L. Allen spent 18 winters at Isle Royale National Park on Lake Superior studying the wolf and moose populations and all the other wildlife. Animals came from the mainland during rare periods when the ice was solid. The fox community provided a unique opportunity to study behavior over the years. This article is excerpted from Allen's book, Wolves of Minong, *to be published this month by Houghton Mifflin Company.*

In the early 1960s, when we first began to see "tame" foxes around the Windigo camp, we did not recognize the beginning of an era that would afford unparalleled opportunities to observe their behavior. Foxes were breeding in the area, and young animals were fed by help at the lodge kitchen (until its closing in 1973) and by the families of other summer workers.

In 1962 we saw "the fox" around occasionally, and in the next two years Sleepy became a part of the establishment. He was succeeded from 1966 to 1969 by Fido, alias "Heikki" (Henry), as he was known by residents of Finnish extraction. Other vulpine visitors were around, which we did not try to identify, except that one was a distinctive grayish female. From physi-

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A satellite view of Isle Royale. East is at the top; Thunder Bay, Ontario, at left; Minnesota, lower right.

cal characteristics, we thought this female and Fido founded the fox dynasty that began in 1970 and was so much a part of our winter scene for six years. These included a new Heikki, whom we gradually came to call by his real title, Dominant Male or just DM; Vixen, a young female; and Blackie (p. 99), a subordinate male—a young silver fox—who spent a lot of time on the outskirts or hiding under a building.

We learned early that foxes would have to be taken into account in our daily operations. When snowshoes were left stuck in the snow by the back door, their bindings were chewed off. One February day in 1966 I made a large kettle of chili—up to the top of a three-gallon pot. I set it out in the snow to cool and then forgot it for a couple of hours. On going out the back door I found the cover 20 feet away and about an inch of chili gone. Chili was splashed on the snow in a ring around the pot, which had melted down even with the snow's surface. Fox tracks left no doubt about the culprit. I brought the kettle in to freeze in the back room. It was the way we kept our soup fresh.

Unlike wolves, foxes do not socialize well with people. Our familiar animals could not be touched, and their chief interest in us was as a source of food, which meant practically anything of organic origin except uncooked vegetables.

No chivalry was involved in food competition. When something was thrown onto the snow, the dominant males usually got it. The strategy was always the same; the successful fox grabbed the morsel and presented its back to the others, body-checking sidewise any animal that tried to get at the prize. Obviously, in these routines there are rules at work; a fox does not attack a superior individual from behind. In a real fight no animal turns its back. Actual fights (p. 91) are rare, but when they occur the blood flows, with each animal grabbing the other by the snout or jaw.

The system of food monopoly that went along with dominance, regardless of sex or condition, irritated Donald E. Murray, our pilot, wolf observer and willing helper. Don would fare forth with a pan of moose-autopsy leavings (which he always brought back for his friends) in one hand and often a stick in the other, and would attempt to bring some justice and morality into the system (pp. 96-97). Actually he seemed at times to make his point, to the extent of a faint indication that the foxes were taking turns. From one day to the next, however, Don always had to start all over again with basic principles.

It is the nature of foxes to curl up on the highest perch available where the view around is advantageous. The turned-up roots of a windthrow, a fallen log, or any high mound of snow would be used as a resting place by our local animals. After snow was dug off the roof, it piled up in the southeast angle of our building nearly to the eaves, giving the foxes ready access to the roof (p. 96). Frequently one or more of them could be seen looking down through our kitchen window as they sought their rooftop napping places. Sometimes these habits resulted in the marking of chimneys or the anemometer, degrading the quality of icicles we used for coffee water.

The arrival of Whiney

In 1971 two young animals joined our winter group, obviously tame as a result of summer conditioning. The female was with us only one season. The male was light in color, like our dominant male, and his character was unmistakable. He was totally subordinate to DM, whose sufferance he cultivated by a perpetual caterwauling from a crouching posture of submission (p. 94). We were to see much more of this fox, who soon earned the name of Whiney.

Vixen produced a litter of six in 1971, according to Windigo ranger Frank Deckert. One of them was still around the following winter. Our new female, yclept Bitch Kitty (p. 90), was a gracile and winsome adolescent with the dark throat and general appearance of Vixen. Ingenuous and trusting, she became a favorite with all. She would be a member of the fox community through 1975.

By the second year it was evident that Vixen was the grande dame of local society and, in an undemonstrative way, the chosen one of DM. Modest and withdrawn, she did not participate in the mad scrambles for food. As someone said, Vixen was the kind of fox

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you would like to take home to Mother. When we arrived each winter, she was in noticeably better condition than the others, and her droppings attested to honest endeavor. They contained the fur of hares caught in fair chase. In a winter when cage traps were set for hares in the campground, someone got to running them and pulling the animals out through the wire. But that could not have been Vixen.

There were many more fox characters, but only one is essential to our story. In 1973, probably from a litter produced by Bitch Kitty, we acquired a glossy light-red, piquant and impish female whom we called, simply, the little female or Little One.

After 1971, when a male named Scarnose disappeared, we never had two truly competing males. We got a distinct impression that in any aggregation of foxes a single male is the quota. DM efficiently repelled all nonfemale joiners except Whiney, who got along passably through his self-debasing tactics. He was an annoyance, but no threat to the system.

When foxes convene at a food source there is aggressive testing, and the same applies to disputes over land tenure. Evidently the males are territorial and the females more inclined toward sharing. However, our females sometimes ran off aliens of the same sex—judged by DM's lack of interest in the matter.

In the typical interaction, two foxes would stand on their hind feet, pawing at one another with their forefeet. Ears would be flattened, tails kinked in an S-curve, and jaws gaping widely. Both uttered a staccato snarling "kuc-kuc-kuc-kuc-kuc-kuc-kuc-kuc," obviously threatening bodily harm. Usually the known subordinate quickly backed down, which meant he crouched and sometimes cried in a high-pitched wavering yowl. This was the fate of any strange males that moved in to challenge DM.

After an encounter, the beaten fox would be further humiliated as our head animal deliberately turned his back and went into a full-dress dominance display. This consisted of a magnificent piloerection—head, shoulders, back and tail—that increased his size impressively. He dropped his tail straight down and humped his back like a Halloween cat. Then DM would stalk away stiff-legged to freshen up his nearest scent post. The interloper would be devastated.

Challenges and dominance testing were frequent and elaborate between males, but often they were male-female and female-female. Young animals sometimes were left crouching in the snow, noses a few inches apart, both crying in a seeming uncertainty of threat and submission.

Through February social tensions mounted, and more foxes would drop in at times to complicate things. By the end of the month there was increasing absenteeism, and it was suggestive when DM and Vixen were gone at the same time.

At home DM displayed a grave interest in the scent marks of all females, and any of the latter might be involved in coquettish tail switchings and slitherings about in the snow. Sometimes DM slithered, too. From 1971 to 1974 Whiney was not much involved. With rare exceptions, he kept shop at the shack while others were off on more interesting missions.

Whiney, second male in the group, survived only by frequent caterwauling, adopting submissive postures.

Whiney later acceded to supremacy when dominant male disappeared; humans found him unconvincing.

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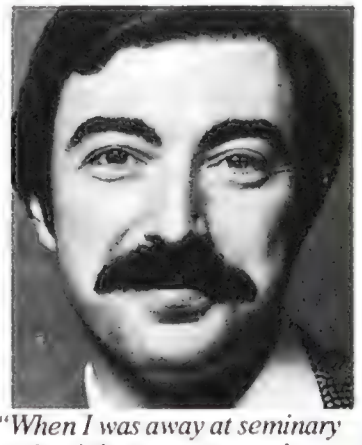

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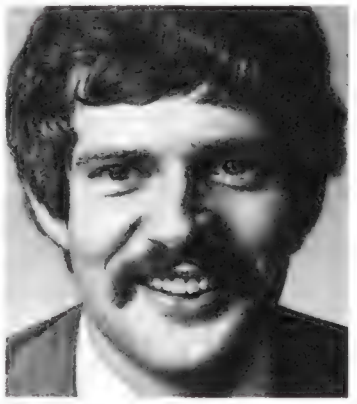

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The foxes make frequent use of elevated perches, here the roof of the researchers' cabin, for a better view.

Pilot Donald Murray tries to break food monopoly enjoyed by the dominant foxes in the group. It

When Whiney was the only male around, we heard little caterwauling, and there was less emphasis on status. Things were much different when DM got back from "a business trip," and it took a few days to reduce Whiney to his usual size. This was especially so on an afternoon in 1973 when DM returned, an ominous kink in his tail. Like Odysseus of old, he found things in what he considered a state, and we were exposed to a degrading spectacle.

Whiney crouched in the snow and cried for quarter, then took refuge behind a screen of small birches. DM was not to be appeased. Swelled out in awesome display, he approached, humped and glowering, hissing and snarling. Repeatedly he struck the bushes with a sidewise slam of the hips. The stricken Whiney was reduced to a psychological shambles, as the Great One turned his back, then eventually moved away to lift a leg at appropriate places. It was the most vulgar exhibition of temper we ever saw, and DM seemed to realize he had achieved something extra. For the rest of the day he sat aside, squint-eyed and flat-eared,

sometimes seemed to work, but he always had to start over each day. Later all fox feeding was stopped.

aloof and grand, gazing imperiously off into the woods, exuding charisma.

I never was able to define the criteria for many changes in status and attitude that took place almost on a day-to-day basis in the second half of February and early March—the mating season. In February of 1974 DM and Vixen disappeared for nearly a week. On February 26 they were back again, and Whiney got the treatment; he raised a continuing racket. I fed DM some bones, which he crunched up and swallowed. Little One was crouching about 20 feet away, and as I stopped at the door, something happened. Suddenly she blasted off like vengeance incarnate, straight at the big male.

DM knew instantly that his fate hinged on a quick getaway. In total abandonment of alpha dignity, he fled over the snow yammering like the most abject subordinate. A red streak of terror, he circled the premises, Little One hot on his tail in deadly resolve to eat him alive. Three times the male sped around the lot, up the ramp and over the roof. On the west

Kitty had no trouble climbing a ladder to get food left for the jays. She then came down head first.

A fox moves in on the remains of a moose killed by wolves. Sometimes foxes wait days for their turn.

side he launched himself into the blue to land in a snowdrift with all four feet spinning. As he emerged in a flurry of white, the young female plumped into the snow behind him.

This was Little One's finest hour. It was no stylized attack, but honest murder in the making, and the boss fox had no doubts. In a wild burst of energy, they skirted the edge of our compound, passed behind the trail-crew cabin, and disappeared in the woods.

Half an hour later they were behind the shack as though nothing had happened. Experimentally, I gave DM a worn-out soup bone. He walked away and buried it. Vixen dug it up, and he appeared not to notice—nor did Little One, although I had a feeling she had come up in the world.

On a February night two years earlier, four of us were in the kitchen eating supper. There were five of our neighborhood foxes in the back lot, all well-fed from the proceeds of a field trip to a moose carcass: about 60 pounds of head, organs and bones. The foxes had been burying food against harder times.

There was a thump and a slight commotion at our door. Don went to the window and looked out. "Would you believe that there's a fox dying on our back step?"

We found a strange fox breathing its last in the shoveled-out entranceway. Whiney had been perched on the snowbank at one side, and the others were scattered about taking it easy. None appeared to have attacked the dying fox. We injected the body cavity with formalin and froze the carcass, later taking it back for autopsy in the veterinary lab. The fox was an old eight-pound male that had lost part of its teeth. But there was no wound and no evident cause of death.

My personal diagnosis was "shock," obviously a noncommital term. I suspected that this fox, driven by hunger, had invaded a strange territory occupied in force by the rightful proprietors. The adventure could have produced a social strain of colossal proportions. By the time he had pursued the enticing aromas to our door, was the buildup of stress just too much for an individual well past his prime? Exactly what occurred we will never know.

A couple of years later I felt a bit better about my guessing while reading S. A. Barnett's *Instinct and Intelligence*. He was discussing crowding and social stress: "An extreme example, which I have studied in laboratory groups of wild rats, *Rattus norvegicus*, is sudden, unexplained death. An adult male, intruding in the territory of others, is attacked by a resident: the attack consists of a threat posture, leaping and brief biting. The biting is usually harmless. The intruder may nevertheless die—indeed, often does so; there are then no postmortem changes to account for the collapse."

I am led to believe that social sufferings are among the worst that befall an animal, including the most sentient of them all, the human. Especially tragic and punishing are frustrations long continued. They lead to desperation and physical breakdown.

The terrors of misfitism and insecurity were evident in the plight of Blackie, although some of this is part of the usual trials endured by young animals. In particular, the potentially territorial males must travel during their first fall and winter. They wander through unfamiliar fox-inhabited country in an attempt to settle down somewhere. Unless there is a high death rate in the population, some will never make it, but will remain unestablished, opportunistic vagrants. Or they can accept the status exemplified by Whiney, which would not always work.

Blackie needed food, but we had difficulty getting any to him when other foxes, including females, were

present. When threatened by another of our boarders —which was nearly always—he would flatten his ears, half crouch, tremble, urinate, defecate and appear to be on the brink of a nervous breakdown. Then he would dash under the building next door. Blackie was inferiority personified.

In the wild the fox is exquisitely adapted for its role as a minor predator in the food chain. Its senses are keen and it is incredibly quick and agile.

The environmental awareness of a fox must be constantly whetted by odors brought on every breeze. The animal readily locates cached food anywhere, and twice I have seen them detect an approaching fox that was out of sight in the woods between 200 and 300 yards away. After one of our moose autopsies in the early 1960s, I bunched up some visceral fat in a wire holder and hung it about six feet up on a tree trunk for the birds. Our familiar Sleepy was trotting through the woods about 30 yards away when he got downwind of the suet. He instantly whirled, nose in the air, came directly to the tree, leaped up to jerk off the feeder, and sped away with it.

Beaver-gnawed tree, like anything unusual along trail, becomes part of the territorial scent-marking system.

On an afternoon in 1972, researcher Rolf Peterson hung part of a moose head in a tree for the benefit of the whisky jacks, the Canada jays. It soon became evident that Bitch Kitty was interested. She pointed her nose up and circled the tree. Rolf had left the ladder leaning against the trunk, and soon we saw the fox at the top of it (p. 97) chewing on the meat. When we went out of the door she came down *head first,* the pads of her small feet hitting the rungs of the ladder with dainty precision!

Another time we saw her climb six feet up the trunk of a ten-inch yellow birch in an attempt to get suspended food. She clasped the trunk with her forelegs and pushed with her back feet, using them alternately. Red foxes like Bitch Kitty, in contrast to grays, are not supposed to be able to climb trees.

On the latter occasion the food in question was a hard loaf of bread I forgot to take out of the oven. I tied it with a cord and hung it up for the squirrels. The first squirrel nearly made a mistake. It clung to the loaf, then severed the string with one bite. Bread and squirrel dropped within three feet of a fox. Both of the animals moved instantly, but the squirrel got up the tree.

In February 1966 we had three feet of snow, and our war-surplus vehicle, a Weasel, had made deep tracks behind the cabin. Don saw one of the squirrels running on the packed snow in the Weasel trail. The animal was too low to see Fido standing nearby, but the fox was aware of the squirrel. As it passed, Fido leaped into the trail and snapped it up. Don said the bones crunched as Fido began eating the squirrel at the head end, and the last thing to disappear was the tail's tip.

I watched both Fido and a wilder fox hunt squirrels that winter. The snow was sufficiently firm so that squirrels were active. One day the wild fox came in for a handout, and later I saw it curled up on a log about 60 yards behind the cabin. It was watching squirrels and whisky jacks intently. It lowered its head flat to the log as our tame (and very fat) squirrel worked closer in traveling over the snow. Finally the squirrel ran between trees only 20 feet away, and the fox made its move. With several bounds it nearly caught the squirrel, which kept about two feet ahead as it made two circles, each time bouncing off trees to keep from getting caught. Finally the squirrel hit the side (rather than the middle) of a tree and circled behind and up. The fox simply walked away.

Blackie shows the rare silver-color phase. For every silver fox there may be many hundreds of red animals.

Fido used the same technique, crouching on the snow at a vantage point with head up and ears cocked. As a maneuvering squirrel got nearer, the head of the fox hugged the snow between its forepaws. I spoiled the hunt by taking pictures, and Fido walked off in disgust. A few days later I found tracks where a squirrel and a fox had rounded a high mound of snow from opposite directions. A patch of blood told the story. There was more blood among the fox tracks on top of the mound.

In 1976 William Kohtala, Windigo maintenance mechanic, told me he saw a fox catch a squirrel by lying quietly near the base of a tree until the squirrel worked its way down the trunk. Then the fox leaped up, knocked it off with a paw, and deftly caught it on the ground.

After we had been in camp for a few days in 1975, it became evident that something was missing; we had not seen Vixen, and DM obviously was not there. The back lot was quiet, and it appeared that the days of Don's "reform school" were over. We were now under the burden of a Park Service mandate not to feed foxes. Each summer the prospering litters had been a nuisance around the campground at Windigo, and our top pair could have been the victims of a deportation program of some sort. We understood the food embargo and did our best to cooperate, although there were occasional emergencies.

I never tried to find out what happened to DM. The truth was, of course, that his churlish cant was not just personal cussedness, but a part of the system. If you overlook the occasional tantrums, he was a forceful personality, one not likely to be replaced.

We did have a dominant fox in 1975—Whiney, no less—and he presided over the remaining females (Bitch Kitty and Little One) according to the rules. His star was risen and his underprivileged past forgotten. By default he had become a dominant male. Now he was first at the food, first on the mound and first in the hearts of his ladies.

The change in social status had obvious physiological effects on this fox. He openly courted Bitch Kitty, his testes enlarged, he began to scent-mark, and he was in breeding condition for the first time in his life. It was another example of those stopgap adaptabilities that so often appear among wild creatures.

We had difficulty adjusting to all this. Perhaps Whiney showed to disadvantage against the high standard of leadership we had known in previous years, but for me his alpha-ism never quite came off. He had been a career subordinate, and his exaltation in one easy leap was a bit much. But inadequacies could have been in the eye of the beholder—his supporting cast did not seem to know the difference.

In particular, he and Bitch Kitty seemed to have much in common. However, she was gone for a time, and on her return it appeared she had been in the wrong company. I heard something in the backyard and went to the window. Ten feet from the door, Bitch Kitty and Whiney were touching noses, something rarely seen. Kitty was in a deplorable state.

Her coat was rough, she looked thin, her left front leg was swollen and useless. I thought it was broken. There was a two-inch gash at the elbow, and when she put her paw on the ground she closed her eyes in a grimace of pain. Pieces of lip were missing and there were cuts on her nose. Blood marked her tracks. She seemed so weak she could hardly get around.

With visible misgivings on the part of Little One and Whiney, we got some food to Kitty, but we had scant hope she could come out of it. In the next few days she spent much time off in the brush, where she was haunted by Little One, who seemed to be taking dominance liberties. Rolf tracked them and kept up on the situation. By that time I had left the island; it was the last of my winter work. Surprisingly, Rolf reported that in another week Bitch Kitty had nearly recovered, and she seemed her old self when they closed the camp.

In one starkly realistic way Whiney was a success: he lived to be at least five years old. Rolf saw him last at Windigo in May 1975. By 1976 the no-feeding policy had dispersed the fox community and returned the winter camp to the squirrels, pine siskins and whisky jacks. An era was at an end, and I was glad to have been a part of it.

As winter ended, researchers left, knowing that they would be missed. They were watched by a lone fox.

Lady Louisa Stuart, witty, acerbic 18th-century gossip, put Lewis on the trail of Walpole.

At 83, Wilmarth S. Lewis (Yale classmates called him "Lefty" after a then-current gangster) has outlived

By Israel Shenker

Can he be the real Walpole or is he Wilmarth Lewis?

The editor of the massive Yale Edition of Walpoliana is a gentleman and a scholar who virtually lives in the 18th century

When he was 26, Wilmarth Sheldon Lewis retired. Possibly we have that unusual occurrence to thank for *The Yale Edition of Horace Walpole's Correspondence*—now 39 volumes and still going strong—called the greatest private scholarly achievement in history.

Wealthy by inheritance, Lewis graduated from Yale and spent two years in the early Twenties as an editor at the Yale University Press. Then he decided to devote himself to what pleased him and, while waiting for the muses to whisper counsel, made himself comfortable in one of the handsome Colonial houses of Farmington, Connecticut, a tree-shaded, architecturally superb town which inspired in Henry James "a positively thrilled attention."

Always an instinctive collector, Lewis turned to books, specifically 18th- and 19th-century English literature. On a buying visit to England, he met a York bookseller who showed him four volumes of *George Selwyn and His Contemporaries* by John Heneage Jesse, and then declared, "This work should be in every gentleman's library." Mr. Lewis had never heard of Selwyn or of Jesse, but he did think of himself as a gentleman. He bought the set.

In the first volume he found 34 octavo pages of handwritten notes by a Lady Louisa Stuart (above left). He didn't know her, either. But one evening, back at

his alter ego by three years, still happily studies at home—the Lewis Walpole Library in Farmington.

Ramsay's portrait of Horace Walpole in 1759 catches him at about the time his gout did—at 42.

Farmington, his dinner guests began reading the notes aloud and were so delighted by their revealing glimpses of 18th-century London society that all thoughts of bridge were abandoned. Lewis, later investigating this lively annotator, unearthed a passage in another book of essays which said that "in some respects, Lady Louisa could give points even to that inimitable gossip Horace Walpole himself."

Seeking additional light, Lewis found more Walpole references. In 1924 he bought a set of Walpole's *Anecdotes of Painting in England* and six of his letters. As he read them, Lewis felt the 18th century come alive; this Walpole was a major literary figure, "greatly undervalued," as Lewis' old friend Chauncey Brewster Tinker, famed Yale teacher and interpreter of the Age of Johnson, agreed.

With the zeal of an apostle preaching the true faith, Lewis started singing hosannas (and signing checks) for Walpole, Walpole and more Walpole. Everything by, for, from, of and on the man had to be in Farmington. Lewis became the supreme Walpolian. ("By his energy, his persistence, his lavish care," J. H. Plumb, the noted Cambridge historian, would later write, W. S. Lewis has collected "more information about a single human life than was ever done before.")

In his amusing and revealing book, *One Man's Education,* Lewis writes (speaking of himself in the third person) that at one time during his years of collecting, he "revolted against" this Walpole with whom he had become so identified that "when he saw 'Strawberry Hill' [the neo-Gothic mansion-showplace Walpole remodeled for himself and *his* collection, outside London], he read 'Farmington' and when he saw 'Horace Walpole' he read 'W. S. Lewis.' " After the new library at Farmington had been finished and the Walpole books put on its shelves Lewis could "hardly bear to enter it." One psychoanalyst reassured him that "this strong reaction was salutary, a protest against being dominated by a man who had lived two centuries earlier. . . ."

The object of Lewis' affliction, born 1717, died 1797, was the third son of Sir Robert Walpole, the great Prime Minister (p. 104), who gave his youngest offspring two lucrative government sinecures and arranged for his election to Parliament. Horace Walpole was a passionate democrat—an early opponent of the slave trade, an ardent defender of America—and the author of estimable works of literature, especially of a mammoth correspondence (which Lewis puts at nearly 7,000 letters), both about trifles of society and affairs of state. His letters gleam with accounts of the discovery of a new planet (originally Georgium Sidus, in

Photographs by Marvin E. Newman

One of Lewis' paintings features Prime Minister Sir Robert Walpole and wife, Horace's parents.

This view of Strawberry Hill, the neo-Gothic villa that Walpole built

honor of King George III—now Uranus), improvements in surgery, prison reform, Franklin's experiments with electricity, a balloon crossing of the Channel. Sir Leslie Stephen, a 19th-century man of letters, suggested that England's history through much of the 18th century was "simply a synonym" for the works of Horace Walpole. Lytton Strachey, the English biographer and critic, thought Walpole's letters to his contemporaries embodied "by far the most important single correspondence in the [English] language."

As Walpoliana flooded into Farmington, to the despair of the local postmistress, Mr. Lewis built additions to his house—a second library, a third library (there are now nine in all), more shelves and cabinets, more desks. He circularized libraries, importuned booksellers, bid at auctions and scoured collections.

Subsidized by Lewis, bibliographies of the Strawberry Hill Press and Walpole's works and a three-volume catalog of Walpole's library—in all, three decades in the editing—were published by Yale. Buying up the volumes Walpole owned, Mr. Lewis arranged them on his own shelves in the precise order devised at Strawberry Hill (p. 108).

One of the principal treasures is a French manuscript translation of Walpole's *Historic Doubts on the Life and Reign of Richard the Third.* Several translators had tried and failed to render Walpole's exquisite prose into suitable French. But in the 1790s yet another Frenchman had a go at it: Louis XVI, awaiting his turn at the guillotine. (In a *Guide to the Life of Horace Walpole,* Mr. Lewis recalls that Walpole, who "agonized over the suffering of the King and Queen, died three years before the translation was published [1800], and consequently never knew that he had indirectly eased the King's last days.") "And here it is," says Mr. Lewis reverentially, extracting the manuscript from its slipcase (p. 107).

The collector commissioned five memorial tablets and mounted them in his East Library. Here are inscribed the names of 35 public institutions that contributed to the collection. They include the Library of Congress, the Folger Shakespeare Library, Harvard University, the American Philosophical Society. "In the case of the Library of Congress and the Folger it was for a check," says Mr. Lewis, lowering his voice. "It all sounds terribly Watergate."

The Walpoliana includes relics which he calls "Bits of the True Cross." There are, from Strawberry Hill, a strip of painted ceiling, a piece of molding, fragments of stained glass. In another of his books, *Collector's Progress,* Lewis tells how he got the molding while being shown around by the vice principal of St. Mary's, the religious teacher's training college which administers Strawberry Hill.

Mr. Shenker, a veteran writer for the New York Times, Time *and* Life, *now lives in Britain. He described Rockefeller archives in* SMITHSONIAN, *September 1977.*

at Twickenham, near London, shows a winding Thames in the background.

Lewis' Strawberry Hill is his 18th-century house (with newer additions) in Farmington, Connecticut.

". . . Father Leonard pointed to a tiny fragment . . . a bit of the original molding, he told us. 'I am now going out of the room,' he said, and went.

"I looked at my wife. The intention was clear. 'What do you think?' I asked.

" 'Oh, no!'

"We stood transfixed by moral rectitude. Father Leonard returned and saw the molding untouched.

" 'The New England conscience, is it? Now I am going out again.' When he returned the second time, the molding had disappeared."

A display case (pp. 106-07) at Farmington has a parasol that belonged to Mary Berry, Walpole's young correspondent and great friend, a gold watch that Walpole gave her and the snuffbox of Madame du Deffand. The latter was 20 years older than Walpole, and blind, and she importuned him with expressions of undying love. He resisted her advances (he never married), but not her correspondence. Upon her death she left him the snuffbox with her pet spaniel Tonton depicted on the lid. She left him Tonton, too, which Lewis once wrote "bit friends as long as he lived."

Lewis has other Walpolian possessions as well—paintings, settees, even the Gothic-revival chairs Walpole himself designed and the architects' original drawings for Strawberry Hill. Set into the wall of the Long Hall at Farmington is the front door of Walpole's town house in London's Berkeley Square (p. 108). Down the hall is a bust of Antonio Cocchi, the Florentine physician who, when Walpole came down with something like a strep throat, saved his life.

In a fireproof addition to the sprawling 18th-century house (above) are books issued by Walpole's private press, all the editions of Walpole's works, nearly 7,000 letters to and from Walpole, a day-by-day record of everything known of every day of Walpole's life from his 20th to his 80th year. There are five miles of microfilm and a million file cards.

One small section of the file covers the meticulous records of what Walpole called his "36 gouts." (Harvey Cushing, the world-famous brain surgeon who was also a learned bibliophile and Lewis' friend, thought this a classic case which might be compared for clinical interest with Montaigne's history of the stone.) "I remember before Walpole's second attack," says Mr. Lewis, sympathy vibrant in his voice. "Parliament was sitting, the heat was intolerable—it was probably up to 70—and he said 'if it goes on I will have the gout.' Not shall have, *will* have."

One of the Farmington guest rooms is full of the works acquired when Lewis decided to get a copy of every book, not already owned by Yale, that had been printed in Britain between 1751 and 1800. This miscellany is known as "Lewis' Folly" to distinguish it from the larger collection now called the Lewis Walpole Library.

When the LWL was just beginning, Mr. Lewis decided there should be a new edition of Walpole letters.

Previous editions had not included letters *to* Walpole, and every edition was marred by errors of transcription and the ravages of censorship. Mr. Lewis decided, too, that his alma mater should publish the definitive edition—at his expense. Yale saluted.

Lewis turned himself into a private endowment for the humanities. He hired researchers, librarians, curators—sometimes as many as 16 at a time were at work—and set them to burrowing at Farmington and in an office at Yale's Sterling Library.

For the past 45 years, the principal collaborator has been Warren Hunting Smith, a scholar of 18th-century English literature who shoulders the burdens of annotation, identifying persons, places and events. He pursues clues in Nichol's *Literary Anecdotes of the Eighteenth Century*, the *Complete English Peerage*, genealogical magazines, biographical dictionaries, county histories, parish registers, state papers and the 18th century's daily press. "A very pleasant and agreeable experience," Smith says of his nearly half-century-long vocation. "There are so many interesting parts to Walpole. One finds correspondence dealing with the Grand Lama of Tibet as well as the introduction of the rhinoceros in Rome."

In 1973 the university celebrated 40 years of *The Yale Edition of Horace Walpole's Correspondence* with a commemoration known as the Jubilee, or "Jube." In his opening address on that occasion, Mr. Lewis noted that 1933 was memorable for three events: Hitler's accession, Franklin D. Roosevelt's first inauguration and the start of Yale's Walpole Edition. "Mr. President, Ladies and Gentlemen," he perorated, "which of these events . . . is still going strong?"

Demand for the Edition, which Virginia Woolf once described as "impossible" to criticize, has proved so brisk that some volumes have had to be reprinted. There are now 39 volumes in print, three in proof, six volumes of index (upwards of a million entries) in manuscript. The press run is 1,250 copies.

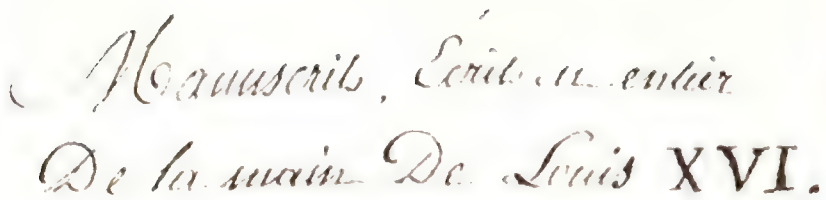
The Edition was to have been completed by 1965, in time for its founder's 70th birthday. It may not be ready until 1980—his 85th. "It really will be the encyclopedia of the English 18th century—not only English but spreading out in France and America," says Mr. Lewis. "People will have to turn to it to learn how the modern age dawned, how its rulers lived and thought. They'll find more in it than in any other publication."

Naturally there is more to come. Lewis has commissioned John Brooke, a British historian, to edit the Yale edition of Walpole's memoirs, and the first of a projected 15 volumes may emerge by 1981. Mr. Brooke has been spending most of his time in Britain, with flying visits to Farmington and New Haven to consult manuscripts and study the Lewis print collection.

Print collection? This sideline dates back to an effort by Lewis' wife, the former Annie Burr Auchincloss. Lewis realized that after her completion of a census of Farmington's historic houses she wanted to go on working. He had an idea. "After 25 years of successful marriage, I knew not to announce it with a bounce," he recalls, "but to creep through the shrubbery." So, offhandedly, he suggested that the Walpole collection could be even greater if it included iconography, but, alas, there was no one who could arrange a collection of prints properly.

Annie Burr took it from there. Her brother Hugh, another Yale man, gave his 5,000 prints to the institution on permanent loan at Farmington. Another collector added 1,500 more. Mrs. Lewis died in

Display case from Strawberry Hill contains cribbage board; a miniature of Mary Berry, to whom Walpole was devoted; Mary's parasol; a gold watch



Louis XVI translated a Walpole book, *Historic Doubts on the Life* . . . while awaiting execution. Manuscript's cover, here, is in nonroyal hand.

1959, but her print sanctuary, converted from a squash court, today has a collection of some 11,500 18th-century prints, which compares favorably with the British Museum's.

When one of the trustees of the Winterthur Museum wondered aloud if curtains in the 18th century reached the floor, Mr. Lewis proceeded to his own print index: "At that point we had only 38 cards referring to curtains from 1712 to 1799, and in no case did they touch the floor. It never occurred to Walpole or Boswell to say 'curtains don't touch the floor.' The prints are wildly important as documents.

"People come on pilgrim feet to see them, and we get a certain number of fanatical specialists in something or other. Some time ago we had a man who was given to candlesnuffers. He came in a rather superior way—he couldn't imagine we could add anything to his knowledge. I had the satisfaction of seeing him carried out, quite limp, saying 'I am overwhelmed.' "

Lewis, recovering from a recent cataract operation, has been both a Fellow of the Yale Corporation and a trustee of the Institute for Advanced Study.

which Walpole bequeathed her; and a gold snuffbox which he was given by another admirer, Madame du Deffand. It bears a picture of her spaniel Tonton.

Lewis has written that his Farmington visitors are divisible into five classes: "(1) those who are afraid they may have to look at the library; (2) those who merely want to say they've seen it; (3) the gushers; (4) the uninformed but interested; (5) the experts. The first class is no problem. The rest are taken into the North Library."

Mr. Lewis says the gushers exclaim over the leather bindings and ask permission to touch one ("the one they touch is the least interesting binding on the shelf"). Class 4, however, delights Lewis, for "they really want to see something of the library and are given . . . 'a Walpole Wallow' that may last an hour."

For Mr. Lewis' 80th birthday—his personal double-Jube—Herman W. Liebert, former director of Yale's Beinecke Library, parodied a Walpole poem:

> He bought and bought and built and built
> Till manuscripts and books in gilt
> O'erwhelmed his dwelling.
> The walls and shelves were all awash;
> Books even banished any space for squash
> And kept on swelling.

Strawberry Hill library (above) held 7,282 titles. About half have been located; about three-quarters of these are in North Library at Farmington (below).

Titles at Farmington maintain Walpole's original order. Lewis' Long Hall (below) features the front door, at left, of Walpole's London town house.

Little pleases Mr. Lewis more than venerating splinters of the "True Cross," reviewing the circumstances of their creation, the stations of their provenance and the triumph of their acquisition. "There's a story about each and every one," he told a recent visitor. "You must come back and hear them all. Oh, you can't—that would be a lifetime."

Lewis has written engagingly of his gains and one loss—a sketch by 16-year-old Jacqueline Bouvier (as she was then) of her aunt, Mrs. Lewis. Yale has recently published Lewis' *Rescuing Horace Walpole,* a fantasy in which God allows the author to save only 26 Walpole objects. The collector is now at work on *Fugitive Pieces,* which includes an account of his 1954 visit to Max Beerbohm in Italy when he gave Beerbohm a copy of *Collector's Progress.* After Beerbohm's death, Lewis purchased his own book back. It was, after all, the work of a Walpole collector.

Walpole, Lewis thinks, would have delighted in such fidelity to his memory. But now that he himself is, as he puts it, "teetery-tottery," Lewis mostly stays at home in Walpoleshire, indulging in occasional "Wallows" and abhorring the very idea of leaving for a vacation. "I couldn't imagine a more ghastly punishment, especially with 'time's wingèd chariot hurrying near.' It sounds odiously virtuous, but I find I'm not happy away from here. The golden moments are flashing by, they'll never come again."

After Mr. Lewis' death, the house and collections will belong to Yale. There will be a director in residence and researchers and scholars coming and going.

"We can put up a few people—half a dozen men and their wives, and a few bachelors," he says. "There will be enough here to keep people busy forever, even if nothing is added. These are the new Dark Ages. I like to think that when the new Renaissance comes—and it will—Walpoleshire will be ready for it."

It's time to face facts

Today, you have to get 60 or more permits to build a coal-fired generating plant. That's about 57 more than it took in 1969.

And all that extra paperwork is costing consumers a bundle in higher electric bills.

Each permit represents time—lots of it. Every day of delay on a million-kilowatt generating plant increases its cost by more than $300,000. Imagine how this adds up, unnecessarily, when the regulatory process is deliberately used to block a project for weeks, or even months.

Even we nonprofit consumer-owned rural electric systems, try as we might, can't hold rates down when it costs six times as much to build a power plant today as it did only five years ago.

Inflation can be blamed for part of the problem, to be sure. But the fact is, today's unwieldy regulatory process accounts for almost one-third of increased construction costs.

That's big money. . . more than $250-million on a typical million-kwh plant.

It seems to us that well-meant efforts to form sensible rules for guiding energy development and use have gone awry, that the historical purpose of regulation has gotten lost. With growing frequency, planners of power generation facilities are being hampered with overlapping, cumbersome, and often inane regulations that serve more as obstacles than as solid, responsible rules and guidelines.

We're not saying, "Down with regulation!"—far from it. A nation such as ours, as utterly dependent on energy as ours, *must* regulate its utility industries . . . sensibly. But let's be aware that regulation, like everything else, bears a price tag.

Let's not keep raising the price.

Commonsense, orderly regulation serves the broad public interest.

Over-regulation does not.

A message from the nation's consumer-owned, nonprofit electric cooperatives and power districts.

America's rural electric systems

For more information, write: Dept S, National Rural Electric Cooperative Association, 1800 Mass. Ave., NW, Washington, DC 20036.

By Evelyn B. McCune

Salute to Korea's rich, emerging artistic heritage

A remarkable showing of national treasures, many of them recently unearthed, begins a two-year tour through seven American cities

Detail of a gilt-bronze dragon finial, which probably topped a pole at least 60 feet high used for flying

The Korea of today is a heady mixture of old and new, affluence and bare survival, semiwar and sudden change. As a sign of its new stance in shifting world affairs, South Korea has sent its most spectacular national treasures to the United States in an exhibit entitled "5,000 Years of Korean Art." The objects displayed represent distinct periods in Korean history when, in turn, shamanism, Buddhism and Confucianism were dominant.

Twenty years ago an exhibit toured America, but it was modest compared to the one that opened May 1 in San Francisco. A stunning new feature has been added: exciting finds from several recently excavated tombs, finds that have not as yet been publicized.

Modern Korea is experiencing a growing awareness of its cultural heritage that is emerging, ghostlike, from the recent finds. The exhibit will be seen in seven cities: Asian Art Museum of San Francisco, May 1-September 30; Seattle Art Museum, November 1-January 13, 1980; Art Institute of Chicago, February 16-April 27; Cleveland Museum of Art, June 10-August 10; Museum of Fine Arts, Boston, September 16-November 30; Metropolitan Museum of Art, New York, January 5-March 15, 1981; Nelson Gallery-Atkins Museum, Kansas City, April 17-June 14.

This is the first exhibit of international importance to have been initiated and organized by the Asian Art Museum of San Francisco since its conception in 1959, when Avery Brundage offered his world-famous collection to the city. In 1976 the director, Yvon d'Argencé, was urged by museum board members to inspect a Korean art exhibit that was then touring Japan. He did, and became enthusiastic about launching a similar show to a broader public in the West. With the cooperation of the National Museum in Seoul and support from the National Endowment for the Humanities, arrangements were made and the objects selected, 345 in all, for a large show.

The main categories are ceramics, precious metals from a shamanist and Buddhist past, and paintings

Buddhist festival banners, dates from eighth-ninth century A.D., during grand days of Silla Dynasty.

Kyongju National Museum

from the Confucian-dominated Yi period. There are 11 entries representing the first three millennia B.C. A cone-shaped jar is the oldest piece, carbon-dated to about 3000 B.C. Eight entries are bronze pieces dating from about the seventh century B.C. to the time of Christ. The significance of most of them—weapons, mirrors, buckles—is easy to grasp, but the meaning of the mysterious star-shaped, eight-pronged jingle bells (p. 112) eludes easy analysis. The implement is decorated with Chinese-derived spirals and yet has no exact Chinese counterpart. It seems to be an object of importance in early Korean shamanism. Such jingle bells are in use still as part of the ritual equipment of women shamans called *mudang*. The star is a symbol of importance in shamanism of all periods, and the bells show how early the Koreans developed their habit of calling attention by musical means.

The next group dates from the fifth to sixth centuries A.D. and introduces us to the sophisticated art of refined shamanism. Most of these pieces were pro-

National Museum of Korea

Eight-pronged jingle bells (top view), probably used in shaman ritual, is dated third-second century B.C.

Silla Kingdom artisans were so skilled, as evidenced by this pair of gold earrings, probably a king's,

duced in the Golden Crown Age, so-called from the whole crowns exhumed to date in all three Korean kingdoms. It is too early to generalize, but on the basis of recently discovered crowns it appears that the elaborate shamanistic crowns came only from the kingdom of Silla in the southeast: they all seem to date from the early sixth century and they honor women equally with men. A Korean anthropologist, Dr. S. Y. Yoon, in a recent study of shamanist practices in Chejudo, says: "In many respects then, shamanism disrupts both patriarchal and matriarchal expectations. By ignoring sexual division in the ritual world it symbolizes complementarity and equality. Women are given cosmic and ritual importance in the eyes of the gods and ancestors."

The crowns are accompanied by other jewelry of a high order: earrings, necklaces, bracelets, sheet-gold ritual shoes, and intricate, openwork belts from which dangle numerous pendants—some supporting charms to ward off evil spirits, others of a practical nature like dainty earpicks, pillboxes and tweezers. A main pendant made up of oval pieces attached to one another by smaller hinged pieces appears on all belts, and similar pendants survive to the present in ornaments now attached to the blouse tie. There are no known equivalents for these crowns or belts in other Asian cultures, so the implication is that they represent persistent Korean shamanist notions. The cause for this persistence in Silla society, as suggested by the Czech scholar Jaroslav Barinka, lies in the small size of Silla and its remoteness from Chinese influence, especially Chinese Buddhism, which profoundly penetrated the other two kingdoms—Paekche in the southwest and Koguryo in the north—at least 150 years before Silla capitulated in 527. Even after this date the animistic concepts and practice of shamanism held their own with Buddhism.

All three kingdoms were slowly centralizing their states out of tribal components during the first centuries of the Christian era, such political changes being accompanied in Paekche and Koguryo by sweeping social and religious changes. In Silla, however, the old shamanist social order remained undisturbed. From the seventh to the 15th centuries Buddhism absorbed some of the practices—worship of the mountain spirit and tiger so conspicuously Korean, for one—and others softened into mild exorcism by the end of the Buddhist era, only to be revived from the 15th to the 20th centuries when shamanism was needed by the women to counteract the extremely repressive and male-centered practices of Yi Dynasty Confucianism.

The jewelry-making techniques of granulation, filigree, inlay and repoussé were mastered by Silla crafts-

Born and raised in Korea, where her parents were founders of Chosun Christian College, Dr. McCune is the author of The Arts of Korea.

Kongju National Museum

that their influence spread to Japan. Jewelry was found in accidentally discovered tomb in 1971.

National Museum of Korea

On the list of numbered national treasures of Korea is this stoneware warrior, fifth-sixth century A.D.

men and applied in such original and creative ways that they constitute what can be called a "Silla style." This style spread to the other kingdoms during the Golden Crown Age and to Japan, where it clearly influenced early Buddhist art there. A pair of king's gold earrings (above) from the dated Paekche Kingdom tomb of King Munyong is an example. The tomb from which they came was not looted. This tomb was discovered accidentally in 1971 and is, without doubt, the most important discovery in recent Korean history, as important for Koreans as the Anyang finds were for the Chinese or the Dead Sea Scrolls for Biblical scholars. An epitaph identifies the tomb, names the king buried there (in A.D. 525) and queen (in 529), and gives dates, so far the only tomb thus clearly marked in all of ancient Korea.

At the time that Buddhism was officially accepted by Silla in 527, worship of Maitreya—the Buddha of the Future—was entering its period of glory, with special meaning for Silla. Faith in this Bodhisattva (whose rebirth on Earth as a Buddha-elect was thought to be imminent and whose paradise was to be tangibly on Earth) was a powerful idea at a time of centralizing campaigns among China's small states as well as among the three kingdoms in Korea, each one of which was now embarking on efforts to subsume the other two. Maitreya became the patron saint of the young warriors in Silla during the "warring states" period of the three kingdoms, from the establishment of Buddhism for 150 years until Silla emerged the victor of a united Korea in the 670s.

Within a few years of the establishment of Buddhism, a great building boom began. Two kings reigned nearly a hundred years, Chinhung and Ching-p'yong (540-632), followed by two queens and the indomitable unifying general, Kim Yu-sin. There was no interruption in the continuity of policy. Dozens of temples sprang up all over Silla, the most outstanding of which was the Imperial Dragon Temple, a monumental project. Begun in the 550s, the construction of the main hall (150 feet by 55 feet), with its imposing facade of ten great pillars every ten feet, took 17 years, and the construction of the culminating building, the nine-story pagoda reaching 224 feet into the sky, was started nearly a hundred years later and completed in 643. Current excavation has uncovered 60 foundation stones, each of which is four feet across.

Dating from the unification period in the eighth or ninth century is a Korean masterpiece, a gilt-bronze dragon finial for a temple flagpole (pp. 110-111). The dragon, symbol of power, was used by Taoists, Buddhists and Confucianists within China and by all the non-Chinese border peoples around China. One aspect of the protecting quality of the Korean dragon was the way it was used by construction engineers at points of stress: on beam ends, finials of all kinds, on carrying-

chair poles, supports for musical bells, sword hilts, handles, drains, ridgepoles and the like. The dragon head in this exhibit was probably used on a pole at least 60 feet tall. It has a hole under its lower jaw where a pulley ring accommodated the rope used to raise and lower the great Buddhist festival banners.

The category containing the largest number of items in the show, ceramics, contains nearly a hundred pieces representing all periods as well as most clays, glazes, styles and modes of decoration.

Silla pottery styles changed after the unification of 668. Footstands were not so high, shapes were new and varied, after the T'ang ideals of China: natural forms taken from gourd shapes, melons, flowers. This taste for simple, lovely forms from nature continued to ap-

National Museum of Korea

A wine cup and stand of celadon-glazed porcelaneous ware, with incised decoration, is from the tomb of King Injong, Kyonggi Province. It dates from the Koryo Dynasty, early 12th century A.D.

peal to Korean taste long after Chinese styles changed.

About the time that the Sung Dynasty unified China once more, in the mid-tenth century, Korea received new impetus for ceramics production, this time in glazes. Glazes with a greenish cast appeared and feldspathic outer coats were fused with coarser bodies to produce semi-opaque monochrome glazes. The method was improved in the 11th century until, in the early 12th century, perfection was achieved in the *pisaek* "secret-color" monochrome accomplished by reduction firing. Koreans were pleased that the great Chinese connoisseurs took note of their top-quality celadons, and during the reigns of the kings Injong and Uijong (1122-1170) produced new refinements: inlaid celadons (underglaze decoration inlaid in black and white and copper-red) which contributed a Korean variation to the great ceramics tradition of northeast Asia.

Empty the cup to find the lotus

A wine cup and stand (opposite) from the tomb of King Injong illustrate the Koryo monochrome tradition at its best, with the secret color. The cup is eight-lobed with a spray of chrysanthemums in each. The lip and foot have scalloped edges, repeated in the foot of the saucer. The saucer has a wide, flat rim with a recessed center in which one finds incised fish among waves. Surprises come in the 13-petaled chrysanthemum on the flat top of the stand, concealed until the cup is raised, and the 13-petaled lotus in the bottom of the cup to be seen only when it is empty.

Although the populations of Korea had been absorbing massive doses of Chinese culture for two millennia, the wary Koreans had managed to keep Confucianism in second place until the Mongol victory over China in the 13th century. Then Korean and Chinese Confucianists, both as underdogs, joined forces, and when the Chinese resumed power in 1368, some years later, a new Confucian-oriented Korean dynasty—the Yi Dynasty—installed itself in Seoul, where it was to stay in power for the next 500 years.

For the first two centuries Confucian influence was at its best, especially in the book-publication field where the Korean innovation of printing by movable metal type was used, predating Gutenberg by some 200 years. A phonetic alphabet for common people was invented and stern measures taken for the improvement of morals. The Confucianization of Korean society took more than a century to implement, however, because Korean customs stood in the way. A fundamental tenet to "rule by example and benevolence" was modified in Korea to rule by law, criminal law at that. The best-known edition of Neo-Confucianism's house rules of Chu Hsi (Chinese) was prepared by Yi Chae (1680-1746), who was also known for his stringent repression of women. The *Portrait of Yi Chae* (above), painted by an anonymous artist, represents the best in the Confucian code: the ideal of integrity in a public official, as well as the man's uncompromising sternness. This portrait also reveals a nationalist bent among many officials who had their portraits painted in simple white Korean robes instead of the official court robes of ornate Chinese style. The white robe is still used by men desiring to assert their Koreanness.

National Museum of Korea

A scroll *Portrait of Yi Chae*, by an anonymous artist, typifies, in its dignity, Confucian code of conduct.

After the Japanese and Manchu invasions of the 1590s and 1630s, Korea closed its doors, becoming a hermit nation. Informality and a studied carelessness invaded all the arts. Chinese themes continued to be

painted by the literati as well as professional artists, but in the 18th century Korean artists began to cast off Chinese themes. A military official of the period, by the name of Sin Yun-bok, painted genre pieces about the life of the nobleman, scandalizing Confucianist puritans by depicting women. The album piece exhibited, entitled *Courtesan's Sword Dance* (below), features a *mudang* dance still popular. A deceptively simple piece by Hong Se-sop, *Swimming Ducks* (opposite), seems modern in composition and feeling.

Korean research in the past decade has discovered an unsuspected artistic heritage and greater awareness of its range and quality. It is emerging that hardly a single facet of the daily life of the past was without its artistic quotient, and not a single style or art form, whether foreign-derived or domestically created, has been able to develop without being nourished in some way by its shamanistic roots.

Zo Za-yong, one of the most insightful of modern Korean scholars, has this to say: "If a Korean is asked, 'What is art?' he might reply, 'Art is an expression of *mot* [flavor, taste] . . . *mot* can be applied to any artistic happening . . . it also refers to the behavior of man as an art. A happening to have *mot* must be, first of all, humorous, also creative and splendid; it must be unpretentious. . . . Art belongs to everyone as a method of beautifying our everyday life and its vitality comes from participation."

Kansong Museum of Fine Arts

An 18th-century military man, Sin Yun-bok, painted scenes of high life, like *Courtesan's Sword Dance* .

Graceful and elegant hanging scroll, *Swimming Ducks,* is work of Hong Se-sop, mid-18th century. The ink-on-paper scene looks modern.

National Museum of Korea

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By Noel D. Vietmeyer

Butterfly ranching is taking wing in Papua New Guinea

By turning insects into a cash crop, villagers have both earned money and helped save endangered species

Angus Hutton, an Australian who helped pioneer the butterfly trade in Papua New Guinea, holds a Hercules moth, left, and rare Goliath birdwing butterfly.

"I suppose you could call the people butterfly farmers," said Peter Clark, a young wildlife officer in Maprik, a tiny jungle town in the East Sepik Province of Papua New Guinea. "To you their livestock must seem exotic, but to villagers in this area it's cattle that are exotic. To raise cattle here the environment must be restructured—trees cleared to make paddocks, fences constructed and palatable grasses sown. Village life has to change to meet the cows' demands, strange rituals must be learned . . . and then comes worry over bank loans, diseases, overstocking, broken fences.

"But take butterfly farming," he went on. "The villager knows his livestock, he knows—better than we—its habits, location and life-style. He can gather butterflies, even rear them. To him, the only absurd thing is that people are willing to pay for them."

And pay well they do. Worldwide demand for butterflies is rising. Millions are caught and sold each year to museums, entomologists, private collectors and, perhaps most of all, ordinary citizens. The fragile, iridescent wings, mounted in plastic, decorate purses, trays, tabletops, screens and other ornamental objects. But these, the product of factorylike facilities, usually incorporate common varieties, most of which come from Taiwan, Korea and Malaysia.

There is a difference between these factory-processed, paper-bodied butterflies bound for novelty stores and what goes on in Papua New Guinea. The butterfly farmers—or ranchers, if you will—of Maprik, and their colleagues around the country, supply high-quality collectors' and students' specimens, accompanied by scientific data. They are the "top of the line" in international trade. And the trade is growing, reflecting a wave of interest in the resplendent butterflies of the tropics.

Papua New Guinea, administered by Australia until it gained independence in 1975, is taking advantage of that interest. Peter, an Australian who went to work for the PNG government after independence, showed me how. We drove up a tortuous ridge behind Maprik, passing through village after neat, palm-thatched village. We eventually stopped at a six-hut hamlet balanced on a knife-edged ridge falling 2,000 feet on either side to the plains. Not a suitable place for a cow farm, I thought. But for a butterfly farm it's ideal.

Peter introduced me to Blu Rairi, the village head. Blu, a 35-year-old Melanesian, pulled out a box containing about 20 triangular paper envelopes. Apologizing in pidgin English for his limited stock, he explained that a few weeks before he had sent off 150 butterflies. He received more than $200 for them.

During the next hour I admired the exquisite, fragile creatures, so rich in color—green, gold, black, red and white etched in vivid counterpoint. Some were quite small, but others were larger than a man's hand.

From Blu and Peter I learned that butterfly trading is booming in the Maprik area. "Three years ago there were two or three collectors who had been taught by an expatriate," Peter said. "Then, early in 1976, we organized the program, and within six months about 50 people in the area were collecting and exporting butterflies."

Blu had started as a collector for an expatriate dealer. For five years he supplied specimens, earning perhaps $30 during that whole time. Now, under the government program, he gets an income of about $100 a month. Furthermore, in the old days he was unwittingly collecting endangered species, whereas today he collects and exports only the ones that are in good supply.

Villagers like Blu spend a lot of time walking in the bush, going back and forth to the village markets or to their gardens hacked out of the jungle. Now, as they go, they keep a sharp watch. With luck, they'll find a chrysalis hanging from a plant. By clipping off a piece of the plant, they can get the chrysalis safely home. There it is hung in a mosquito net tacked loosely to the roof of their hut until the

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What looks like a flower garden here is actually a pasture for new livestock: butterflies. Each plant is chosen for its value as food or shelter for the insects.

adult butterfly is ready to emerge. It takes several hours to stretch and dry its wings, so the mosquito net is checked regularly and any new butterflies removed. The perfect specimens are kept but all the others are released.

Peter takes a long-range view of the butterfly industry. "What we've been doing so far is harvesting the wild insects," he said, "but now we're moving toward raising our own under true farming conditions. Instead of going to the butterflies, the villagers are making the butterflies come to them."

Blu now gathers most of his pupae from his garden in which he produces food for both butterflies and larvae (caterpillars). Already more than 20 other small butterfly farms have been established near villages and hillside gardens in the Maprik area. They are certainly among the most unusual farms in the world. "Our pasture is a far cry from clover," Peter said, "but it's much prettier." He showed me some of the plants that the butterflies feed on—I saw the gorgeous blooms of hibiscus, flame-of-the-forest and many others that I couldn't identify.

Adult butterflies have mouthparts adapted for drinking, not chewing. Their main food is nectar. So around the edge of the farm are planted flowering shrubs to attract the initial stock and to retain succeeding generations in the area. Within half-acre circlets of these flowers are planted leafy plants that the caterpillars feed on.

This enriched habitat attracts butterflies, which then feed and breed in the farmer's backyard. The female butterfly is often fertilized by the male even as she emerges from the chrysalis. She then feeds and begins searching for a suitable plant on which to lay eggs. On the farm, there's a good chance she will lay them on a plant within the circle. Thus, the farmer can maintain his own population.

Insects are such excellent reproducers that, once the farm is established, a butterfly farmer will no longer need to go out to collect specimens from the bush. "Indeed, we're beginning to have problems with overstocking and have had to shift larvae from plant to plant," said Peter. "It's rather like moving cattle from paddock to paddock as the grazing runs out."

The farmers take only about half the pupae they find in their gardens. The others are left to maintain the breeding stock. It is true butterfly husbandry.

"The government never forces people into butterfly farming," explained Peter.

The author, a specialist in tropical agriculture, wrote about Charles Ledger in SMITHSONIAN, *August 1978.*

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Blu Rairi, nearest camera, presents his dried specimens to be inspected and

"It just makes knowledge and some starter kits available to those villagers who request it." A prospective butterfly farmer receives a syringe, a pile of small squares of blotting paper diagrammed to show how to preserve and dry a butterfly, and sometimes a butterfly net. From a trade store or extension officer he can buy ethyl acetate, an industrial solvent that if injected into the thorax kills the butterfly instantly and painlessly.

"But," I asked, "don't you have to have some skills to farm butterflies?"

"Well, initially the people catch everything," Peter replied. "So the first time they bring specimens in I spend a couple of hours showing them flaws—such as missing legs, tattered or broken wings. Then they don't capture the damaged ones, which are left free to breed." Other subjects covered include ways to avoid overcollecting or destroying butterfly habitats, plant species that can be grown to encourage butterfly populations, and how to sun-dry butterflies.

packed by wildlife officer Peter Clark, seated. They will be mailed abroad.

I had been driven the 90 dusty miles to Maprik from the airport at Wewak by Leo Ning, a native-born Papua New Guinean of Chinese descent. Leo explained how butterfly farming fits the village life-style. "It's only since the Europeans have come to this area that the villagers have wanted to work," he said. "Now they've seen things like radios that they like and want. The major industry round here is growing coffee; each village has a few acres and they've been very profitable recently. But producing coffee is labor-intensive and requires alien skills. Producing butterflies doesn't. With insects the villagers can work when, and if, they want to. There's no capital outlay (except postage on the first parcel of butterflies), no deadlines, no hard labor, no danger. Of course it takes a fair bit of walking around, which the people do anyway. Also planting and maintaining the gardens and caring for the insect specimens can be a lot of work."

Leo pointed out that the village people

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Rairi injects a newly emerged butterfly (genus *Troides)* with a killing fluid.

have an extensive knowledge of their wild plants and animals. Indeed, because biologists haven't yet detailed the life cycles and food plants of most Papua New Guinea butterflies, the villagers themselves are the experts.

Butterfly farming is beginning to improve the welfare of many villages. Sales to Europe, North America and Japan are already becoming a major source of income for Maprik tribesmen. Prices paid by U.S. dealers range from 30 cents for common species to around $10 for the two birdwing species whose export is allowed. A specimen of a rarer species (for example, the female *Graphium weiskei)* may bring $50. Peter's goal is to export 2,000 to 3,000 specimens a month, from which the villages in the area can expect a return of perhaps $2,000.

I asked if the market demand would hold up in face of such exploitation.

"Together with South America, we've got the most gorgeous butterflies in the world," Leo explained. "The market won't dry up. It's like stamp collecting; every year there are more collectors. Besides, when people see what we can offer here, butterfly collecting is going to become more popular all over the world."

Indeed, because of the size and beauty of its species, Papua New Guinea is a Mecca for insect collectors. It has the largest known butterfly in the world (the female *Ornithoptera alexandrae),* one of the largest moths *(Cosinocera hercules),* some of the largest stick insects, and the largest known grasshopper *(Siliquofera*

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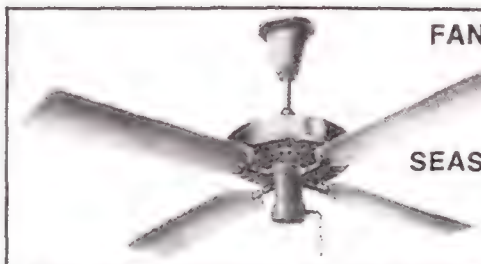

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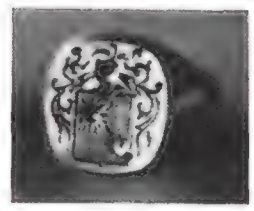

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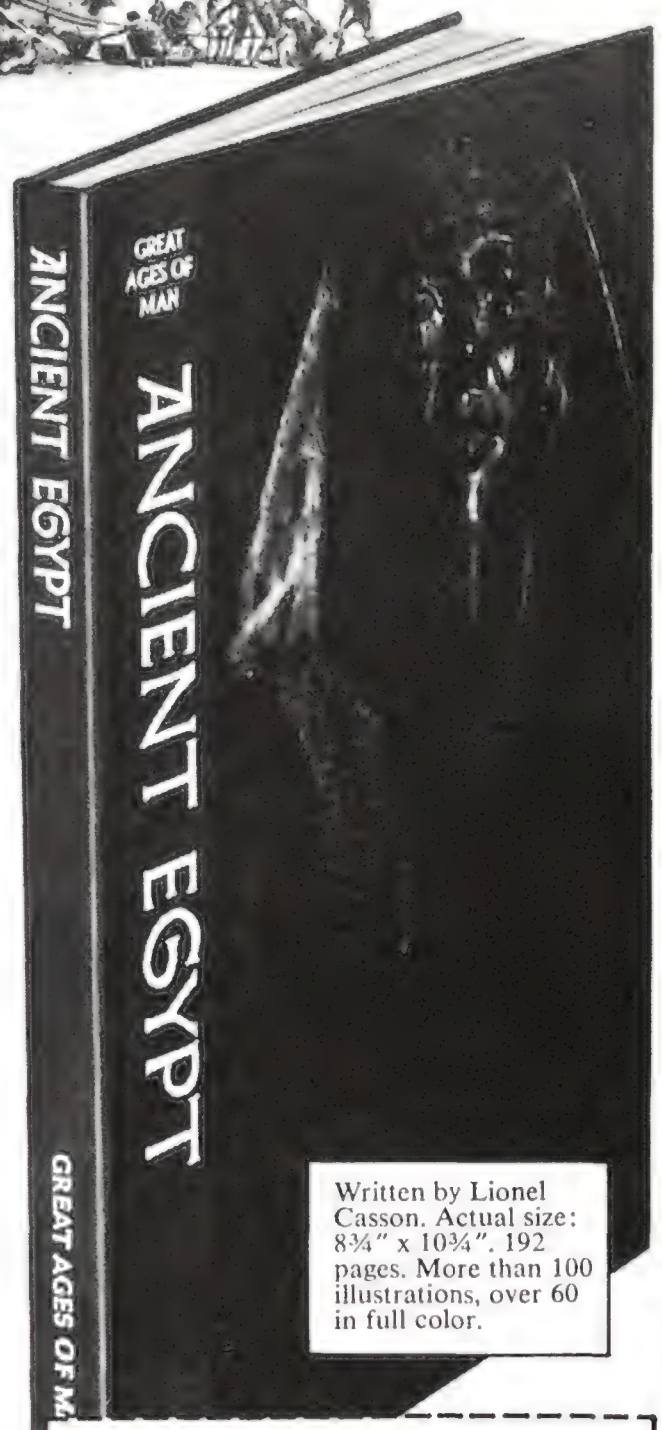

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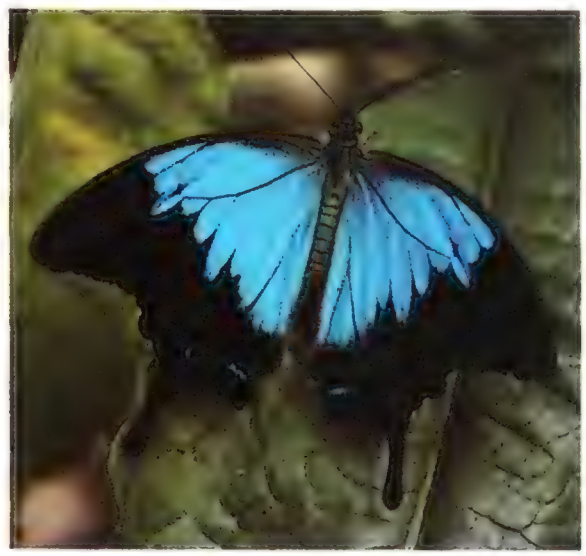
grandis). The country's wide variety of insects results partly from its wealth of different environments, ranging from coastal swamps to high mountain valleys, each isolated from the others over evolutionary time. A butterfly in one valley is likely to differ from its close relatives in the next valley a few miles away.

Back in Port Moresby, Papua New Guinea's capital, Navu Kwapena, Assistant Secretary of the Department of Lands and Environment, explained the government's position on butterfly farming. "We consider insects a national resource for our people," he said. "We're promoting an industry that enables village people to participate in the cash economy without conflicting with traditional farming and village life."

Fred Parker, Navu Kwapena's associate, told me that the government's Insect Farming and Trading Project was started in 1974 with fewer than 30 Papua New Guineans from villages in three of the nation's provinces. By 1978 more than 500 villagers in ten provinces were farming or collecting butterflies and beetles for export. Most of the credit, I later learned, should go to Angus Hutton (p. 119), a tea planter who had come to Papua New Guinea by way of Kenya and India and who now has retired to farm in Australia. Peter Clark has replaced him as head of the project, and Clark expects to be replaced in turn by native-born Silas Kiafuli, who learned the operation as Hutton's assistant.

Until 1974 expatriates controlled the extensive export business in butterflies and beetles, especially in the rare and


A popular swallowtail is the *ulysses*, whose larvae are easily reared on "weeds."

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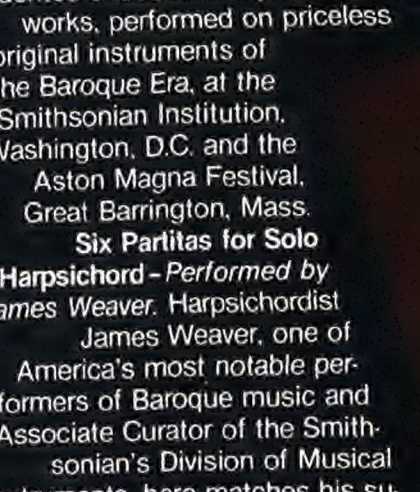

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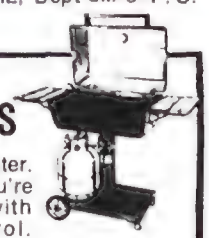

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Young collectors move through a rain forest, Karkar Island, seeking specimens.

beautiful birdwing butterflies. Each specimen, bought from village people for 10 to 20 cents, or less, could be sold overseas for 50 cents to $250, or sometimes more.

With such markups possible, wildlife has become a major item for international smugglers, and Papua New Guinea, with its unique animals, is a prime smuggler's target. Accordingly, the government has stringent controls on the export of butterflies and other insect specimens. Often baggage leaving the country is searched, and a permit is required before even a single butterfly can be removed. No permits are issued for seven protected birdwings. Furthermore, international agree-

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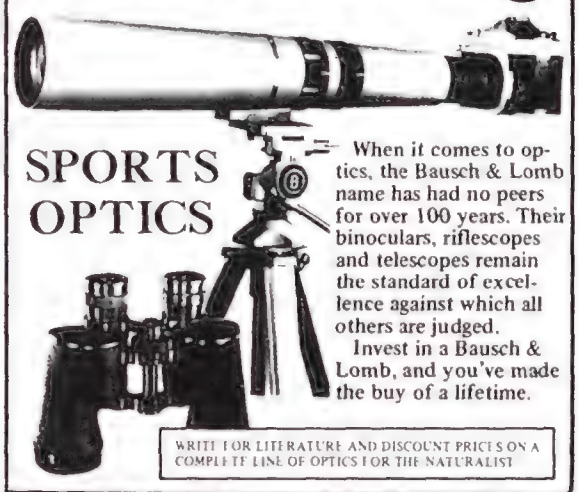

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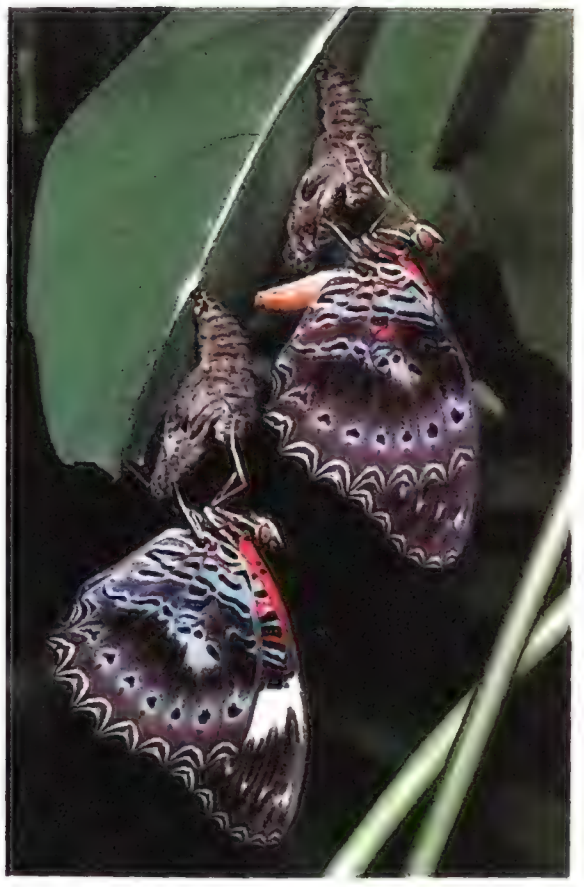

Two freshly emerged red lacewings hang from their pupae to let their wings dry.

ments specify that even butterflies shipped through another country must be covered by a permit from their country of origin.

"Most of the birdwing smuggling was to the United States," Navu Kwapena told me. "Now we have it under control. In just the last two years half a dozen expatriates have fled the country to avoid prosecution. Amateurs still get some butterflies out, but the organized smuggling has been largely crushed."

The government, however, is engaged not only in suppressing the illegal traffic, but also in actively encouraging the legitimate insect trade. It stresses quality and exports only the best specimens, each individually wrapped in paper triangles,

Another red lacewing shows the colors that make it popular with collectors.

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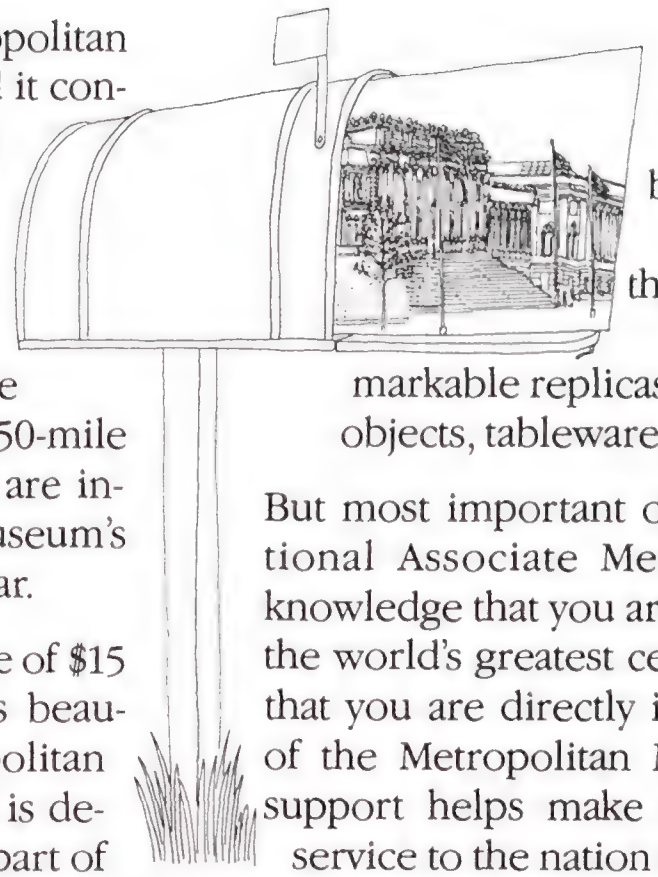

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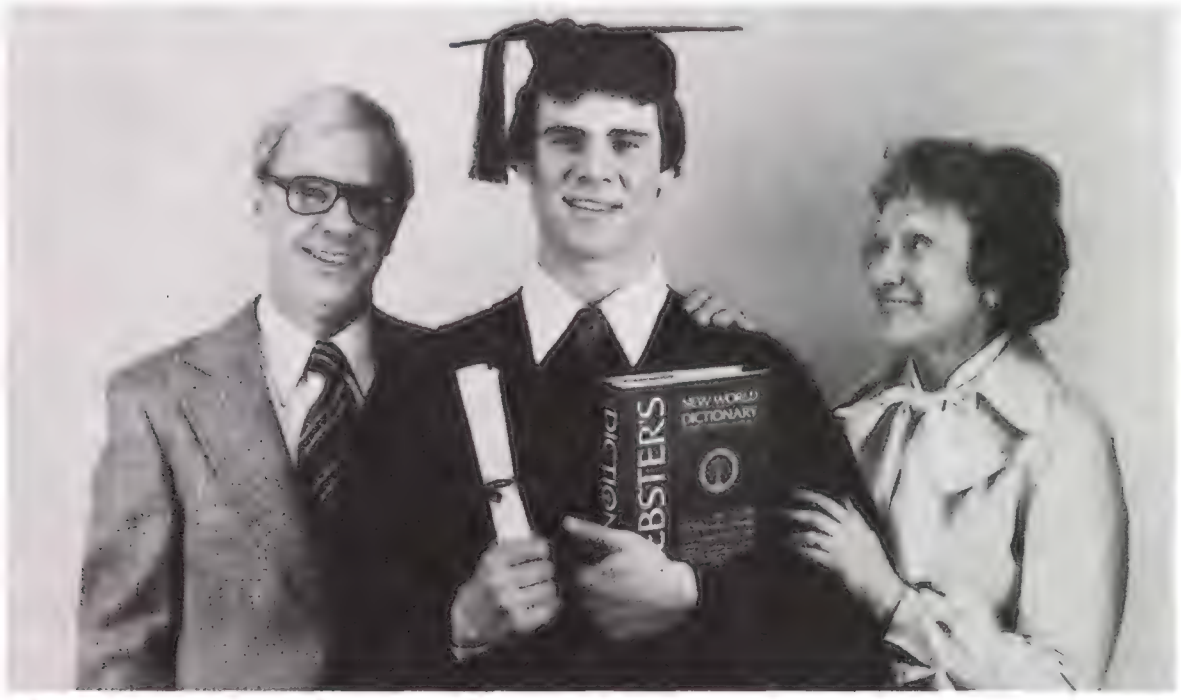

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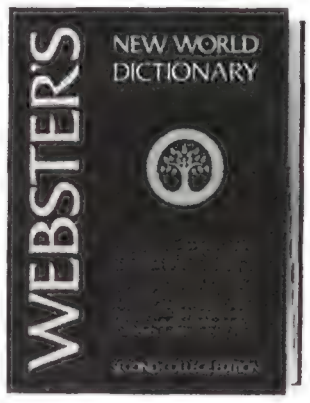

COLLINS PUBLISHERS

Hutton uses a book to tell participants which species should not be captured.

marked with where and when caught, and packed in heavy cardboard. Under new laws, anyone trading commercially in insects must be a Papua New Guinea citizen. The government monitors the prices paid by overseas buyers and furnishes them with a catalog of species available in an effort to develop the best possible overseas markets.

At Bulolo the government has now established an insect-buying agency, a marketing outlet for insects from all over Papua New Guinea. It purchases insects from farmers and fills specific orders requested by overseas buyers. Profits go to the villagers.

Everywhere I went I asked about the conservation aspects of exploiting Papua New Guinea's wild butterflies. To my surprise, everyone pointed out that they were actually conserving, and sometimes increasing, the numbers of butterflies.

Navu Kwapena explained that all the species being traded at present are plentiful in most parts of the country, and that since 1968 there has been a law against taking even a single specimen of seven birdwing species now threatened with extinction. These brilliantly colored, giant creatures can bring as much as $1,800

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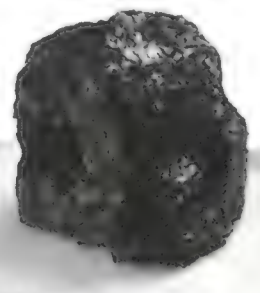

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each in international trade, but there is now a stiff fine even for possessing one. Also, he said, a butterfly reserve is planned for Popondetta on Papua New Guinea's north coast. And the government is setting up wildlife management areas administered by one or more village councils to preserve and protect butterflies and other wildlife resources.

"Basically," Fred Parker explained, "we hand responsibility for the butterflies back to the village . . . we don't have to do the law enforcement—they do that—and much more stringently than we could." In some areas village councils have ruled that for every ten chrysalides collected, the butterflies from six must be released. Some villages have named one day of the week for collection. Violators are fined. And sometimes outsiders have to pay the village committee a fee to collect on their land; any intruder is quickly spotted by a member of the village.

Saving the seven birdwings

The next challenge in conserving the butterflies is to save from extinction the seven birdwing species that are now endangered. Peter Clark has already found that two other birdwing species are easily farmed by planting *Aristolochia tagala* as food for the larvae. Some other *Aristolochia* hosts for the endangered birdwings are also known. This knowledge could lead to farms designed especially to build up the populations of these rare butterfly species.

In late 1977, Dr. Robert Pyle of the Nature Conservancy in Portland, Oregon, spent three months in Papua New Guinea working with the butterfly farming program. His wife, Sarah Hughes, was botanist for the project. She helped find new host plants so that more species could be reared rather than collected. Pyle worked chiefly to identify important habitats for reserves and management areas. He is now chairman of the Lepidopterist Specialist Group of the International Union for the Conservation of Nature and Natural Resources.

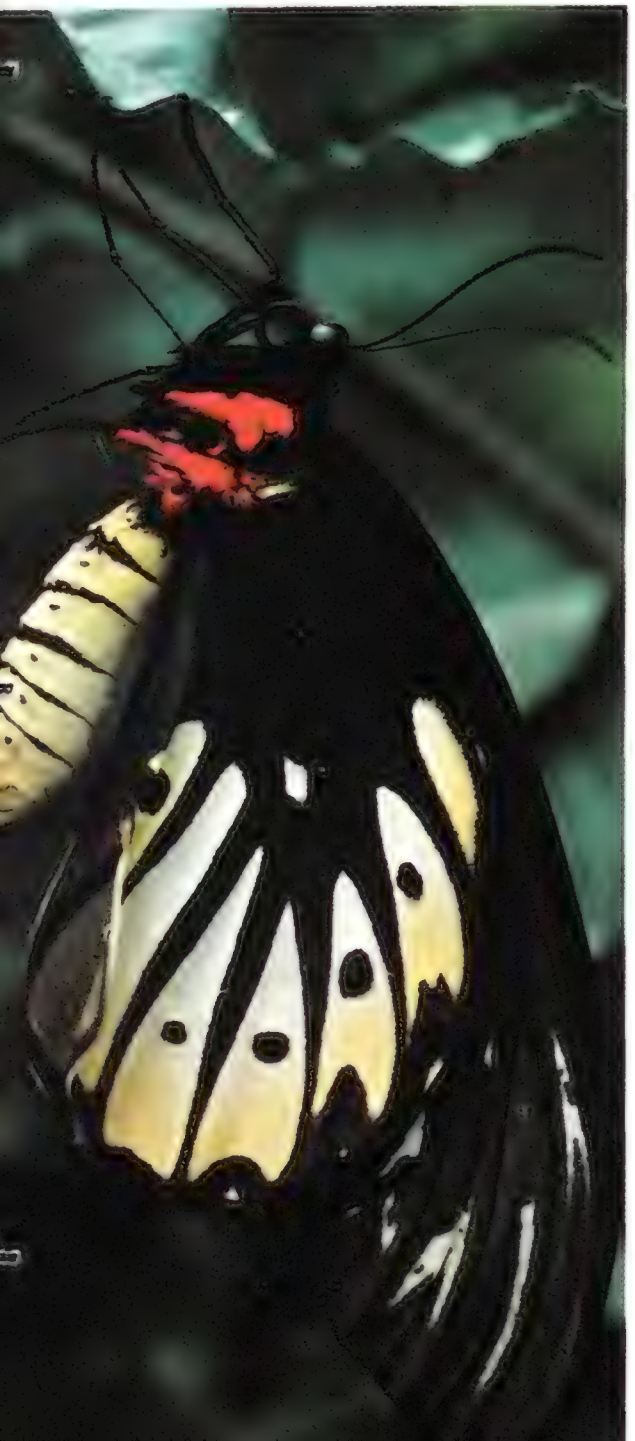
"The PNG butterfly farming approach is an exciting, pioneering effort in conservation," he says. "It can relieve pressure on the bush populations and at the same time give the villagers a stake in habitat protection. To have successful butterfly farms, they must retain a healthy wild population in the bush. We may

not like the idea of commercializing butterflies, but this is inevitable in a rural, resource-based society such as that in Papua New Guinea. At least now the profits go entirely to the villagers, the butterflies are nurtured as a continuing resource and both the populations and the habitat are conserved."

Indeed, Pyle believes that Papua New Guinea's program may provide a model for some other nations where butterflies are captured and exported. "It is a matter of good stewardship," he says.

Farmers who raise butterflies, crocodiles, cassowaries and other wildlife are just a few of the new breed now appearing in Papua New Guinea. In helping rural Papua New Guineans to participate in the cash economy, the nation's leaders are striving to project their country into the 21st century, even—in a very small way—on the wings of a butterfly.

This female is a rare Queen Alexandra birdwing. Listed in Guinness as the largest known butterfly in the world, its wingspan may exceed 11 inches.



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A CRY FOR HELP

The humpback whales once filled the seas with their beautiful, haunting "songs." But today the humpbacks are nearing extinction, and the survivors are crying for help.

The last of the great whales are being ruthlessly massacred by commercial whalers from Japan, the Soviet Union, Norway and a handful of other countries. Millions of whales have been hunted down this century, so many that the humpback, blue, right and bowhead whale species may be past the point of saving. Now the whalers are greedily wiping out the other species of great whales—the sperm, fin, sei, Bryde's and minke whales.

Why are the whales being driven to the brink of extinction? To make mink food, fertilizer, cosmetics, margarine and lubricating oil. There are cheap, plentiful alternatives for all these products, but the slaughter continues. The whaling nations have repeatedly refused to stop the killing despite an international outcry from conservationists and scientists and appeals from the United Nations.

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We know that Japan and Norway subvert the whale quotas set by the International Whaling Commission (IWC). They allow their whalers to own and operate whaling ships in countries that are not members of the IWC. Operating outside any regulation, these whalers in Peru, Chile, Taiwan, Spain and Cyprus wipe out thousands of highly endangered coastal whales, even "protected" species such as humpback and blue whales.

Japan flagrantly imports thousands of tons of whale meat from these non-IWC whalers and has allowed the export of several whaling ships to increase the illicit slaughter. Japanese and Norwegian interests own and operate the infamous pirate whaling ship Sierra which decimates entire herds of whales—even nursing mothers and infants—in the Atlantic. The IWC has repeatedly called on Japan and Norway to halt such support for unregulated whaling.

The whaling nations are expected to fiercely oppose a proposal by the U.S. and other non-whaling nations for a moratorium on commercial whaling at July's IWC meeting in London.

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Book reviews

West by West at 32 in London (detail).

Benjamin West: A Biography
Robert C. Alberts
(Houghton Mifflin, $20)

If American history sometimes seems built on the lives of Horatio Alger characters, the same is true of the history of American art. One of the earliest success stories was that of the painter Benjamin West (1738-1820), and it is told in a new biography by Robert C. Alberts, the first in almost 160 years.

West had more of Dick Whittington in him, perhaps, than of Horatio Alger. Born in rural Pennsylvania, he took London by storm. He became a leader in the half-century span of the Golden Age of British art, a founder of the Royal Academy of Arts (he was elected president 27 times), a friend and favorite of George III, and a respected figure on the cultural scene of the day.

His rags-to-riches story has often been exaggerated, however, for he had his ups and downs both during his lifetime and afterward, and his reputation suffered ridicule and neglect from the 1830s until as late as 1938. Alberts successfully reconsiders West's controversial reputation.

The author evocatively establishes West's background as the son of a lapsed Quaker and innkeeper, his childhood in Colonial America, the recognition of his budding talents by a visiting cousin and then by a series of intelligent and intellectual leaders of Philadelphia society. These men formed the first links in the golden chain of patronage that furthered West's career; they helped send him to Italy, where he studied art and soon became known as "the American Raphael." The darling of worldly Roman society, he charmed Europeans with his story of how he had learned to use paints from the friendly Indians.

In England, West rapidly rose to the top of his profession and captured the "great prize," the patronage of the king. Alberts' George III is a man different from the customary villain of the American Revolution, a cultured, overworked and lonely man, victimized by bouts of madness now known to have been caused by a physiological disorder. He is joined by a piquant cast of characters: the flirtatious Angelica Kauffmann, a competitive John Singleton Copley, the homosexual William Beckford and West's colleague Joseph Farington, whose diary, first unearthed in the 1920s, is one of the main sources for Alberts' study.

West's artistic achievements were as impressive as his social ones. He was a force in the movements of neoclassicism and romantic idealism. He also broke the traditional proscriptions against using contemporary or historically accurate dress in history painting. In his often visionary and dramatic allegorical works, which the king dismissed as "Bedlamite" scenes, he anticipated 19th-century Romanticism. When he won a royal commission to paint a series on the history of revealed religion, West took a revolution-

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Today's rejuvenated Lake States forest is mostly aspen, pine and spruce. It's nurtured by forest products companies who value their stewardship of the land and are alert to its potential. For example, aspen, once considered a "weed tree," is now an important source of wood fiber for paper. Nearly every part of every harvested tree is used, right down to the sawdust. And where natural regeneration is slow, foresters hand plant the next generation of trees. They thin and fertilize and grow better trees, faster.

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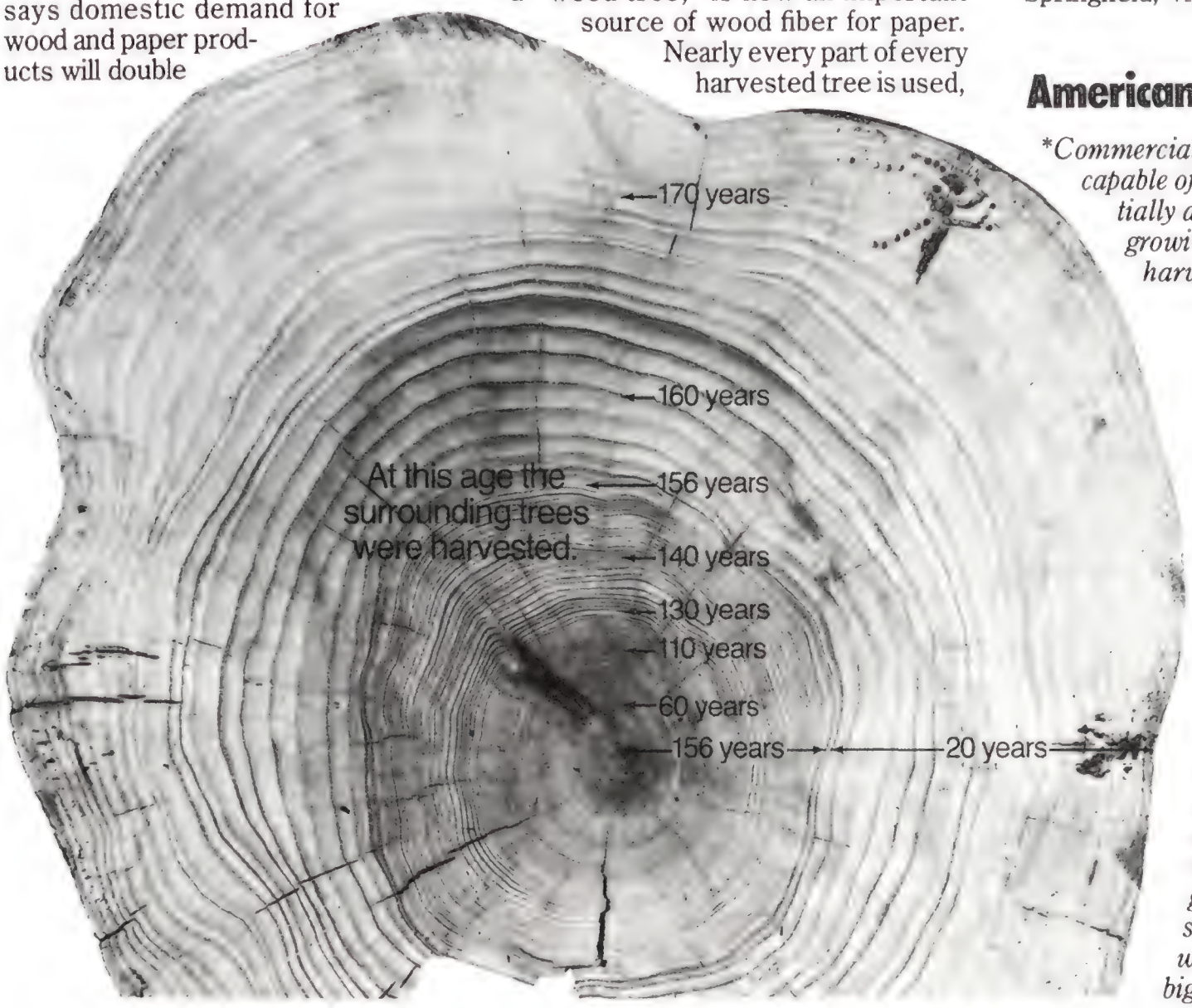

After 156 years, this Eastern Hemlock was still too small to harvest when the trees around it were cut down. But with more room to grow, it doubled in size. (Shown here slightly less than 1/2 actual size.) Today, thinning the forests to give each tree more sunshine and nutrients is one way foresters can produce bigger trees faster.

ary step, for there had been no support for religious art in England since the Reformation.

At the same time, West clung to several old-fashioned attitudes, such as his belief in the overriding importance of morality in art. His position as an American in England during the era of the American and French revolutions was a precarious one—politics seemed to play as much of a role in artistic life as esthetic concerns.

As Alberts abundantly illustrates, the situation of artists in general was uncertain, dependent as they were upon fickle patronage and the whims of a public manipulated by an abusive press. Alberts' book, in fact, is more about the early decades of the Royal Academy than anything else.

Alberts devotes much time to the rise, fall and frequent reestablishment of West's many friendships and animosities, for they provided the main pattern for his life. Along with lengthy forays into contemporary history, politics, economics and social issues, the blend forms a rich background.

As in a flawed painting, West the man is never fully integrated with this overly detailed backdrop. There is not enough about West's art nor about West as a person; it is as though he were composed of a selection of Alberts' doubtless phenomenal number of note cards rather than of flesh and blood. The author has not only filled a gap in the history of American art, but has filled it to overflowing. His reassessment of West is interesting and convincing, however. He separates myths from realities, personal gripes from justified resentments, and provides information and inspiration for further study of Benjamin West and his times.

—Celia Betsky
American Association of University Women and Smithsonian Fellow

Shinohata: A Portrait of a Japanese Village
Ronald P. Dore
(Pantheon Books, $11.95)

Japanese novelist Yukio Mishima once said that it is virtually impossible for non-Asians to understand Japanese culture. Indeed, few writers have been able to present a clear picture of Japan's unique society and culture to English-speaking audiences. Mishima and others have singled out *The Chrysanthemum and the Sword* by American anthropologist Ruth Benedict as the best book on the subject. It is likely that British sociologist Ronald Dore's *Shinohata* will be a worthy successor to Benedict's 1946 landmark achievement.

A leading authority on contemporary Japan, Dore visited the small agricultural village of Shinohata in 1955 to study Japan's post-World War II land reform. He returned periodically to write and do some further research, finding Shinohata a convivial and relaxing place to work. Dore aptly describes his latest book as a "mix of anecdote and what some people might be pleased to call structural analysis." He succeeds quite well, delivering "neither a scholarly production nor [one] sufficiently remote from scholarship."

Weaving personal interviews with sociological analysis, Dore—to his credit—uses a minimal amount of technical jargon. The book is full of characters who tell their stories. Through them Dore ex-

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amines how Japan's economic prosperity has touched the lives of the people of Shinohata. In so doing, he gives insights into how the traditional way of life in rural Japan has been affected by the nation's impressive rise from the ruins of World War II.

When Dore first came to Shinohata he found a rustic farming community. Most of the houses had open-air hearths, earthen-floored work areas and no indoor plumbing. By 1977, the villagers enjoyed most of the amenities of modern living. Paper sliding doors had given way to glass on aluminum runners. And, Dore informs us, the village is now on its "second generation" of television: color.

The physical improvements have also been accompanied by social change. Modern cultivation methods have freed most of the men to work at part- or full-time jobs in nearby industries. And the women are no longer slaves to backbreaking duties in the rice fields. The once economically depressed village now enjoys modest prosperity.

Dore tells his story in a careful yet graceful manner. He writes with a sociologist's professional curiosity, but also shows concern for the people whose lives he so closely examines. In his introduction, Dore makes plain his desire to avoid "a tone of knowing superiority." This aim is borne out in the writing that follows. Dore provides a compassionate, yet impartial narrative that gives the general reader a clear picture of life in rural Japan today.

—Marc Leepson
Staff writer, *Editorial Research Reports*

On Human Finery
Quentin Bell
(Schocken Books, paper, $6.95)
In Fashion
Prudence Glynn
(Oxford University Press, $19.95)

It would appear that Man saves his most waspish deprecations for fashion. No creative art, no mode of behavior has been subjected to more invective, yet none has been so slavishly followed and revered as the fashion of the time.

We are told by Charles Churchill, an 18th-century poet and satirist, that fashion is "a word which knaves and fools may use, Their knavery and folly to excuse." In *Much Ado About Nothing* Conrade japes, "I see that the fashion wears out more apparel than the man."

What is it in our nature that cows us into this docile, irrational pursuit of standards of dress, laid down as capriciously as they are taken away? What ambition drives men and women to truss, bind and drape their torsos into unnatural encumbrances only to be twisted in another direction next year?

While Quentin Bell in *On Human Finery* does not pretend to have written the complete guide to fashion and folly in the Western world, he does make a valiant, highly readable effort. Actually a revised edition of a book originally published in 1947, Bell bases his history of dress since the 16th century on Veblen's *Theory of the Leisure Class.*

Thorstein Veblen was an American economist whose *Theory* appeared in 1899. His thesis with regard to fashion was, essentially, that "the need of dress is eminently a 'higher' or spiritual need" and that the absurd deviation of fashion

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The Lockheed Vega 5B, the aircraft used by Amelia Earhart when she became the first woman to make a solo nonstop flight across the Atlantic, has been completely restored and is exhibited in the National Air and Space Museum. The original fabric, removed from the aircraft during restoration, has been cut into squares and is available to the public mounted on handsome 15" X 20" posters suitable for framing. The Lockheed Vega poster is the sixth in the Aviation Relic Series. The other four posters in the series which are still available are the Douglas World Cruiser, the Curtiss NC-4, the Fokker T-2, and the Vin Fiz.

These unusual posters are collector's items due to their historic value and the limited quantity of fabric. They will make a unique gift or an intriguing decoration for any office or home.

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Her dinner jacket was *In Fashion* in 1926.

from economic laws is really a social exigency which has little or nothing to do with warmth and modesty.

Veblen broke his thesis down into three "canons of taste." The first, "Conspicuous Consumption," is the display of one's wealth by one's clothes. "Conspicuous Leisure," the second, is "visible evidence that one is leading an honourably futile existence" or, as Bell puts it, "clothes of indolence" which make physical labor nearly impossible. The third, "Conspicuous Waste," is the dramatic, possibly heroic, expenditure of wealth, as exemplified by the jewelry and funerals of the ancient Egyptian nobility.

Curiously, Bell does not include in his amusing catalog of extravagant fashions the European practice of "parfilage." Known as "drizzling" in England, this game of unraveling gold and silver threads from clothes probably destroyed more fine 18th-century garments than the French Revolution. The practice went to extremes, and thus became unfashionable, when a duke was indecorously undressed at court.

While Bell is not inflexibly wedded to Veblen's theories, they do provide his book with a framework and are, I think, as good a guide to the fluctuations of fashion trends as any. The problem with Veblen comes, as Bell readily admits, in the 20th century when the rigid class structures of the preceding 500 years began breaking down.

After 1924, Bell feels, the influence of the Great War, the emancipation of women and their emergence as an economic force change the protocol of stylish competition. With the erosion of class distinctions, the 20th century becomes a fashion free-for-all. While Bell does not mourn this decline, he makes clear his sense that a coherent history of contemporary fashion must be based on less rigid economic and social premises.

The premises on which *In Fashion* is based are certainly less rigid; they are not, however, particularly coherent. A first book by the first fashion editor of *The Times* of London, *In Fashion* is more a kaleidoscopic glimpse of styles than an objective appraisal of esthetic trends. The book has a chatty, spotty quality that is often charming but sometimes cloying.

Like Bell, Glynn contends that "dress is a key to social advancement" as well as a "barometer for those who wish to read between the lines of social history." The book is strongest when she follows these thoughts through. While making some tenuous correlations ("Without doubt, the Pill bred the mini, just as it bred the topless bathing suit"), Glynn conveys her sense of fashion as the handmaiden of history very amusingly.

After all the lines have been read between, however, it is the illustrations that make this book worth its price. Collected by Madeleine Ginsburg of the Victoria and Albert Museum, they are a superb chronicle of the irrationality of dress in our time. Whoever said "Clothes make the man" couldn't have seen these pictures.
—Jill Merrill
Washington, D.C., free-lance writer

Environment, Technology, and Health: Human Ecology in Historical Perspective
Merril Eisenbud
(New York University Press, $19.50)
Footprints on the Planet: A Search for an Environmental Ethic
Robert Cahn
(Universe Books, $10.95)

These two books confirm that environmentalism's age of the prophets has passed: the roar of the apocalypse is heard only faintly in each.

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The jacket of Dr. Eisenbud's book informs us that his career in environmental health—as scientist, practitioner, governmental administrator and teacher—has spanned 40 years. Putting us on notice that he was making the good fight long before environmentalism enjoyed its flowering in the 1960s, he makes no effort to hide his exasperation at much of what has happened since:

"The words 'environmental crisis' have permeated the popular vocabulary and have been perceived by many to mean literally that human existence is being jeopardized," he complains. "Much of the world has been inundated by wave after wave of acute concern about pollution problems. . . . Unfortunately, the information about these problems has not been presented to the public in a balanced manner."

Eisenbud's book attempts to restore the balance and, to a large extent, succeeds. The book makes a good introduction to environmental health science, for it is public health that is his overriding concern. One by one he assesses the controversies that swirl around such environmental contaminants as lead, mercury, DDT, PCBs, carbon monoxide, photochemical smog, nuclear wastes and sulfur dioxide, and consistently the writing is scholarly, lucid, instructive.

The major limitation of the book is self-imposed and has to do with his insistent focus on health to the exclusion of other environmental concerns—endangered wildlife, for example. The author comes at us from an earlier era. Recalling the time when there was a sharp distinction between the fields of environmental health, on one hand, and ecology and wildlife protection, on the other, he laments the fact that they all got mixed together in the 1960s. The ecology crowd, he complains, has injected itself into complex environmental-health issues beyond its ken. But I wonder if Dr. Eisenbud isn't too intent on taking the ecologists to task, particularly when he taxes them as well for not taking sufficient interest in a whole host of other perennial problems, from cigarette smoking to violence on television to indoor safety. He protests too much. What is lacking in this book is acknowledgment that the nature of Man's relationship to the rest of the planet has changed drastically in the quite recent past and that this ought to concern environmentalists of all stripes. It

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will not do to dismiss the shock of recognition as hysteria, to belittle the new impetus ecologists have given to the solution of traditional environmental problems or to depreciate their sounding the alarm about the radically new relationship that has evolved between Man and nature.

Robert Cahn does much to give credence to Eisenbud's exasperation.

Mr. Cahn's book takes us on a search for an environmental ethic, a search conducted largely through interviews with businessmen and environmentalist gurus. The environmental ethic is variously described as living "in harmony with the natural order," trying to "tread more lightly on the planet," and being free "from excessive attachment to material goods, so that more wealth can be shared with those who need the basic necessities of life." If all that sounds like the Boy Scout oath, well, the two are not quite the same. The environmental ethic is both more and less—a hodgepodge of ideas ranging from the zero-growth concepts of computer analysts to mystical exhortations about the inalienable rights of trees and rocks.

Except that he means well, it is hard to tell where Cahn himself, a Pulitzer Prizewinning journalist, stands amid all this. He makes little concerted effort to think through the complex issues he raises, and merely passes on to the next interview instead. At times he seems to understand as well as Eisenbud that environmental decision making is complex and that it is frequently hard not only to do what is right but to know what is right. Much of the time, though, he seems determined to treat environmental issues as fundamentally ethical, as if progress will consist largely in making converts to a right way of thought.

In actuality, the environmental ethic for which Cahn is searching may be more widespread than he would have us believe. One of our big national pollsters recently found that a surprisingly large majority rate environmental problems as important and, even in the era of Proposition 13, are willing to spend to solve them. If that poll is accurate, it suggests that the slow pace of environmental progress that Cahn bemoans has to do with problems deeper and more complex than the receptiveness of people to the environmentalist cause.

—Benjamin Haimowitz
Science writer and editor

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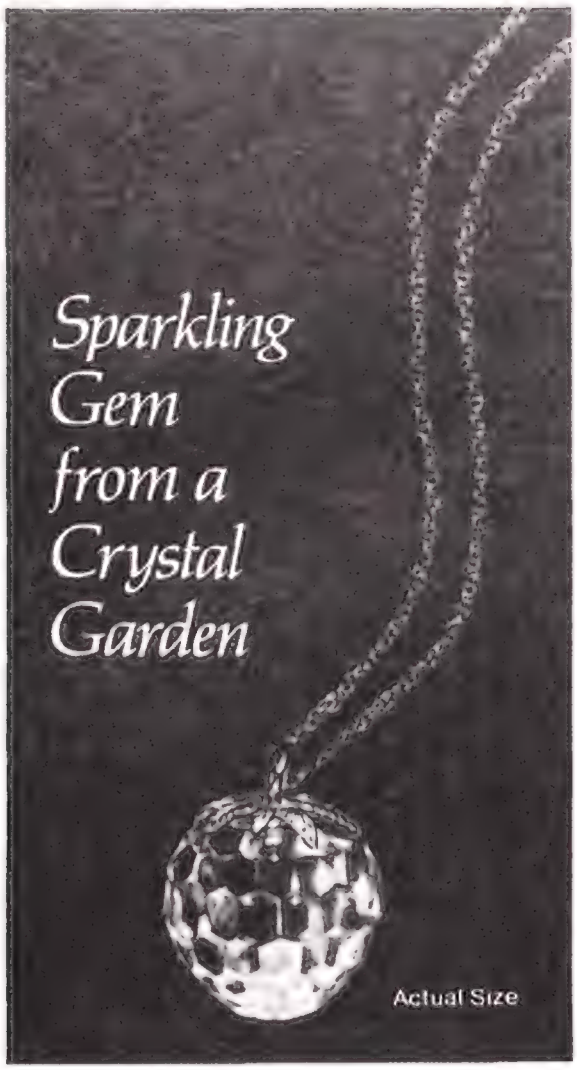

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Additional reading

Multiple Mirror Telescope (p. 42)

"The Multiple-Mirror Telescope" by Nathaniel P. Carleton and William F. Hoffman, *Physics Today,* September 1978

"Mirrors on the Universe: The MMT Story," a 16mm color film coproduced by the Smithsonian Institution and the University of Arizona. Available for purchase or rental from Radio-TV-Film Bureau, University of Arizona, Tucson 85721, telephone (602) 626-1434

"The Multiple-Mirror Telescope: An Engineering History, Description and Status" by T. E. Hoffman, Center for Astrophysics Preprint Series No. 877, Center for Astrophysics (60 Garden Street, Cambridge, Massachusetts 02138), 1977

Egypt (p. 54)

Ancient Egypt by Lionel Casson and The Editors of *Time-Life* Books, Time-Life Books Inc., 1965

Ancient Egypt, published by the National Geographic Society, 1978

Daily Life in Ancient Egypt by Lionel Casson, American Heritage Publishing Co., 1975

Phillips Collection (p. 68)

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"Duncan Phillips, Collector as Critic: 1920s" by Bess Hormats, *The Phillips Collection in the Making: 1920-1930,* Smithsonian Institution Trav-

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eling Exhibition Service and The Phillips Collection, 1979

Skylab (p. 80)

"New Peril from the Space Race" by Tad Szulc, *Reader's Digest*, December 1978

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The World of the Red Fox by Leonard Lee Rue III, Lippincott, 1969

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Collector's Progress by Wilmarth S. Lewis, Knopf, 1951

One Man's Education by Wilmarth S. Lewis, Knopf, 1967

"The Steward of Strawberry Hill" (two-part profile) by Geoffrey T. Hellman, *The New Yorker*, August 6 and 13, 1949

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Smithsonian highlights

George Latshaw, one of the most creative artists in the puppetry field today, is coming to the Smithsonian this month and his performance is a dandy—not to mention a literally handy—one.

During a three-week stay in the Arts & Industries Building's newly renovated Discovery Theater, Mr. Latshaw, an Ohioan, demonstrates his special talents with hand puppets. There's Prima Ballerina Mademoiselle Rosemary, assisted by balletomanes Basil and Oregano in a "Pas de Deux pour Trois," and a little chap named Wilbur, determined to teach baseball to a basset hound.

Another vignette, "A Bird in the Bush," starts off innocently enough with a display of two gloved hands. After a friendly wave, one hand, with a property or two added, turns into a cocky little bird; the other sprouts into a splendid bush. Drama unfolds as bird discovers bush, nibbles blossoms approvingly and eats the flowers, one by one. As their stems wilt and fade, bird next tackles glove, whips it off and swings it around victoriously. Hand goes limp, lifeless but then —ta dah!—(we'll keep you hanging).

Puppeteer George Latshaw's "Troupers in a Trunk"

Special May exhibits and events

Air & Space Museum
Our Beautiful Earth: The View from Air and Space (opens May 5)—The work of four contemporary photographers who specialize in aerial views of Earth (SMITHSONIAN, April 1979).
The Problems and Potentials of Vertical Flight (May 17, 8 P.M.)—Annual aviation history lecture: John Fozard, British Aerospace Aircraft Group.

Anacostia Neighborhood Museum
Out of Africa: From West African Kingdoms to Colonialization (through 1979).

Arts & Industries Building
Discover Puppets!—Roman Paska (through May 13): George Latshaw's hand ballet (May 16-June 10—below left).

Cooper-Hewitt Museum (New York)
Porcelain at the Cooper-Hewitt: A Selection (through May 13).
Take Your Choice: Contemporary Product Design (through May 13).
Japanese Collections in the Cooper-Hewitt Museum (through May 20).
MA, the Japanese Concept of Time and Space (through May 27).

Freer Gallery of Art
Early Christian Manuscripts [Armenian] (May 18-November).
Japanese Lacquer (through October).

Hirshhorn Museum & Sculpture Garden
Alfred H. Maurer: The HM&SG Collection (May 9-August 12)—Exhibition of 16 works by an American modernist active in vanguard circles of Paris and New York.

Museum of History & Technology (MHT)
[*Albert*] *Einstein: A Centenary Exhibition* (through March 1980).
Indianapolis 500 Racing Cars (permanent exhibit)—Mario Andretti's "Cinderella Car" and Parnelli Jones' "Silent Screamer."

Zoological Park
Beaver Valley (opens May 4)—A wooded 1,000-foot-long ravine has been transformed into new homes for gray seals, timber wolves, California sea lions, beaver, crab-eating fox and North American river otters.

National Collection of Fine Arts
American Theatrical Figures—(May 4-September 9)—These 65 lithographs and woodcuts present some of the most fa-

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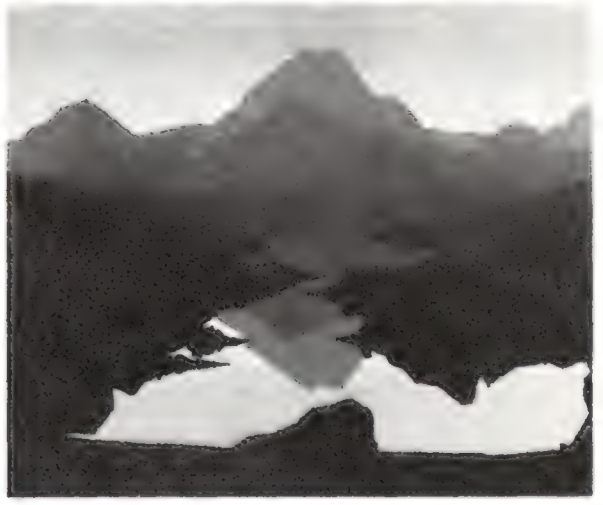

Jerome Schurr's *Lake Powel*, original serigraph. Signed limited edition of 250.

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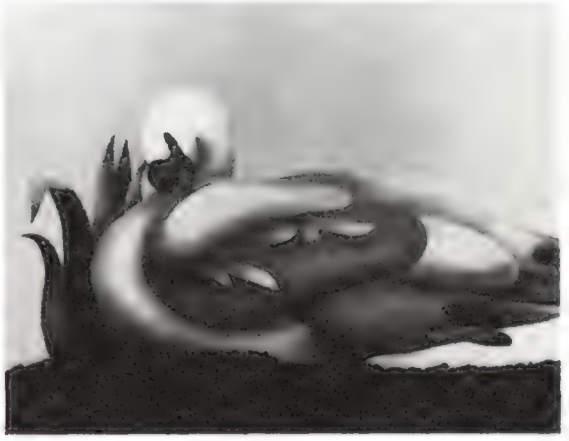

Jean-Paul Donadini's *Le Songe*, original lithograph. Signed limited edition of 150.

Cuca Romley's *Sky Flyers*, original hand-colored etching. Signed limited edition of 150.

Lillian Rothenberg's *Chioggia*, original etching. Signed limited edition of 195.

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NCFA Traveling Exhibitions

Perceptions and Evocations: The Art of Elihu Vedder (May 8-July 8)—The Brooklyn (New York) Museum.

Contemporary Art from Alaska (May 15-June 30)—Fine Arts Museum, Anchorage.

National Portrait Gallery

They Have Made a Nation (May 11-October 7)—Lee, Davis and P. G. T. Beauregard are some of the colorful figures portrayed in this exhibit dealing with creation of the Confederate States of America.

Return to Albion: Americans in England 1760-1940 (through September 16).

Renwick Gallery

Buildings Reborn: New Uses, Old Places (through August 19).

Renwick Gallery Traveling Exhibition

Craft Multiples (through May 13)—Erskine College, Due West, South Carolina.

Museum of Natural History (MNH)

Japanese Dolls Today (through June 3)—A collection of 125 contemporary dolls.

Dynamics of Evolution (opens May 18)—This new Permanent Hall hails a "dynamic" as opposed to a "static" view of living organisms (exhibit specimen below).

Smithsonian subscription events

Hirshhorn Auditorium

The Contemporary Architecture of Japan (May 9, 6 P.M.)—Lecture by Ching-yu Chang, assistant professor of architecture at Carnegie-Mellon University and editor of *Process Architecture* (202-381-5157).

One Hundred Years of French Music (May 12 and 19, 5:30 P.M.)—Recital by pianist Carla Hubner (202-381-5395).

MHT's Carmichael Auditorium

Back to the Drawing Board (May 1, 8 P.M.)—Wolf Von Eckhardt, architecture critic of the *Washington Post,* on the joys and rewards of the new urban rehabilitation (202-381-5157).

Three Decades: Postwar Japanese Society Through Film (May 3, 7, 10, 14, 17, 21, 24 and 31, 8 P.M.)—New film shown on each date (202-381-5157).

MHT's Hall of Musical Instruments

Smithsonian Chamber Players (May 6 and 7, 8 P.M.)—All-Mozart program with guest pianist James Richmond (202-381-5395).

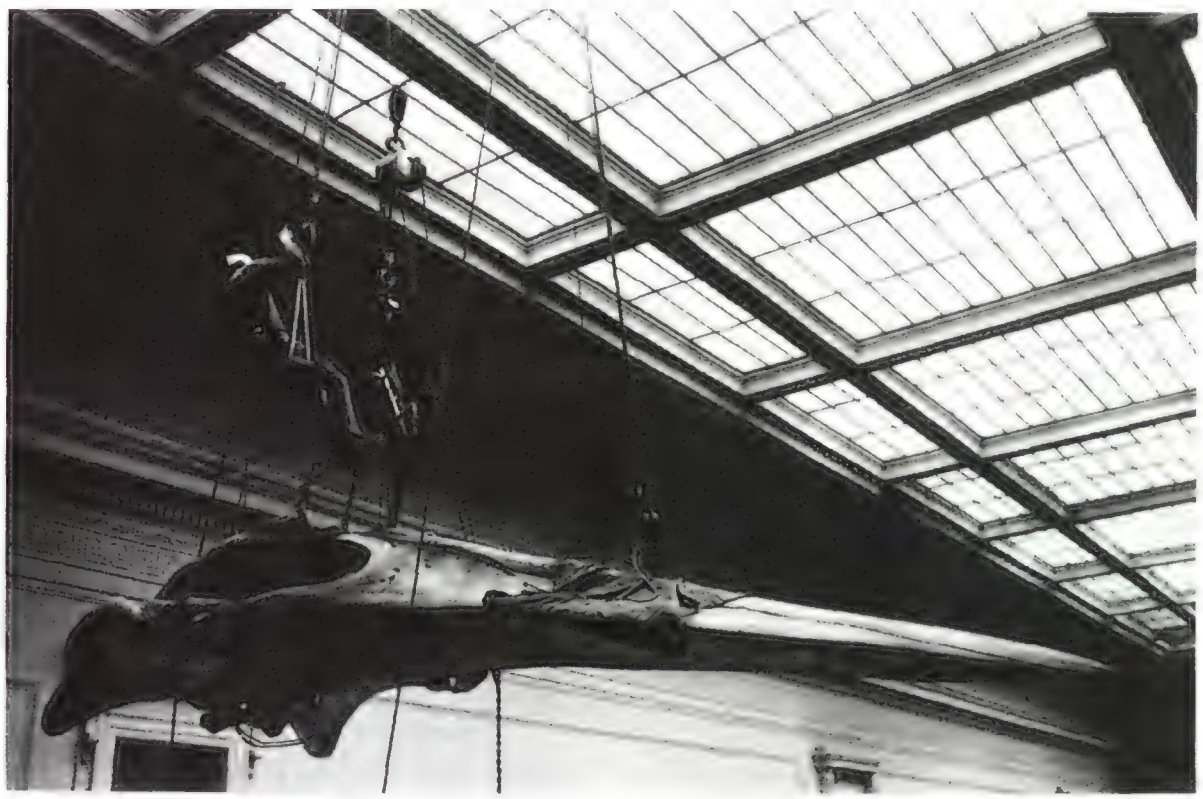
MNH's Baird Auditorium

Bioluminescence: Light from Life (May 2, 8 P.M.)—John Buck, chief of the Section of Comparative Physiology at the National Institutes of Health, surveys the emission of light from animals and plants, and its importance to scientific knowledge (202-381-5157).

A Musical Revelation: How Broadway Did It (May 6, 3 P.M.)—Tony Award-winning musical director Donald Pippin (*A Chorus Line, Oliver*) and cast show transformation of a scene from drama to musical theater (202-381-5395).

The Music of James P. Johnson and Fats Waller (May 13, 8 P.M.)—Duo keyboards and small ensemble present individual works and collaborations of these stride-piano masters (202-381-5395).

The Stonemans (May 20, 8 P.M.)—Washington, D.C.'s first family of country music performs (202-381-5395).



A 19-foot-long whale skull is hoisted into place at Museum of Natural History.

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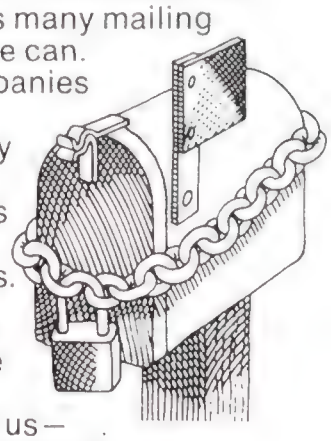

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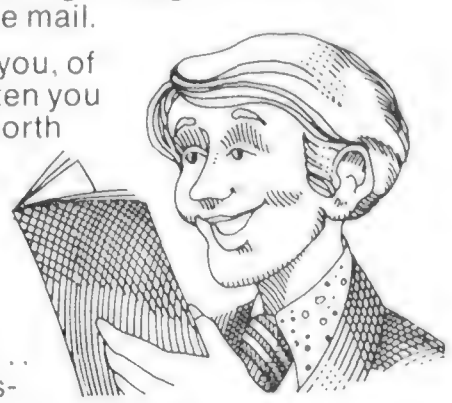

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The Amboseli Elephants: A Family Saga (May 21, 5:45 P.M.)—Lecture by Cynthia Moss, widely known for her studies of East African mammals (202-381-5157).
New Eyes on the Universe: The Multiple Mirror Telescope (May 22, 8 P.M.)—Herbert Gursky, Smithsonian observational astronomer, discusses the MMT's development (pp. 42-51) and its effect on astronomy (202-381-5157).

Membership benefits when visiting the Smithsonian

The Associates Reception Desk, in the Castle, is open from 10 A.M. to 4 P.M. daily for registration, event-exhibit information, a special orientation publication and the Associates' *Guide to the Nation's Capital and the Smithsonian Institution.*

The Associates Lounge, a quiet place to relax in the Castle, is open from 10 A.M. to 5:30 P.M. daily.

The Members' Dining Room, **"The Court,"** in the Museum of Natural History, is open Monday through Friday for breakfast (8:30-10 A.M.), for lunch (11 A.M.-3 P.M.) and for dinner (4:30-7 P.M.) and on weekends for breakfast (8:30-11 A.M.), for brunch (11 A.M.-3 P.M.) and for dinner (4:30-7 P.M.).
For pre-visit information packet, send a postcard or phone the Associates' Reception Center, Smithsonian Institution, Washington, D.C. 20560 (202-381-6264). Allow two weeks for receipt.

Radio Smithsonian

This music-and-conversation program is broadcast weekly on approximately 50 stations across the country. For times (the program differs in Washington, D.C.), consult local public-radio stations:
Battle of Britain (week of May 6)—Two World War II aces—Stanford Tuck of Great Britain and Adolph Galland of Germany—look back on the harrowing days when they were deadly enemies.
White on White (week of May 6)—A look at the art of Ben Nicholson, a central figure in British painting for more than 50 years, and now the subject of a major U.S. retrospective.
On Jupiter and Mars (week of May 13)—A tour of the Air and Space Museum's new "Exploring the Planets" gallery with deputy director Melvin Zisfein.
Artist of Mystery (week of May 13)—A look behind the strange and haunting images of the eccentric American painter, Louis Eilshemius (SMITHSONIAN, November 1978).
Telling Lives (week of May 20)—Two authors, Doris Kearns and Leon Edel, explore the interplay of fact and imagination in writing biography.

Remembering Margaret Mead (week of May 27)—A tribute to the work, vitality and humanity of the woman who was America's best-known anthropologist.

Smithsonian Galaxy: These new, 2½-minute, twice-a-week features probing the worlds of natural science, the arts, history and air-and-space exploration are now available, free of charge, to radio stations across the nation. If interested in hearing them, notify your local radio station. For further information write this program care of Office of Telecommunications, A&I 2472, Smithsonian Institution, Washington, D.C. 20560.

Japan Today symposiums

Japan Today, a two-month celebration of the arts and culture of modern Japan, continues to unfold—through mid-June—in a series of concurrent events in seven cities: **Washington, D.C., New York, Chicago, Denver, Los Angeles, Boston** and **Miami.** Nationwide symposiums, sponsored and organized by the Smithsonian (along with the Japan Society and Meridian House International), feature art exhibitions, film series, panel discussions and performing arts concerts, many held in major cultural institutions. For the "when and where" of Japan Today in your area call toll-free 800-243-5000 (in Connecticut call 1-800-882-5577).

Smithsonian Institution Traveling Exhibition Service

SITES circulates exhibitions to hundreds of cities outside Washington, D.C. To sponsor a show in your community, write to Eileen Harakal, SITES, Smithsonian Institution, Washington, D.C. 20560. Here are some May openings:

San Diego (May 12-June 10)—*Photographing the Frontier,* Federal Building, Court House.

Newark, Delaware (May 12-June 10)—*Images of Old Age in America,* University of Delaware.

Miami, Florida (May 5-June 3)—*Frederick Douglass Years,* Dade Public Library.

Abilene, Kansas (May 5-June 3)—*America's First Ladies,* Eisenhower Library.

Lexington, Massachusetts (May 12-September 15)—*French Folk Art,* Museum of Our National Heritage.

Ann Arbor (May 5-June 3)—*The Tallgrass Prairie,* Matthaei Botanical Gardens.

Billings, Montana (May 12-June 10)—*Sculpture of Jacob Epstein,* Yellowstone Art Center.

Elyria, Ohio (May 12-June 12)—*Inaugural Story,* Midway Mall Office.

Seattle (May 5-June 3)—*Images of Earth from Space,* Pacific Science Center.

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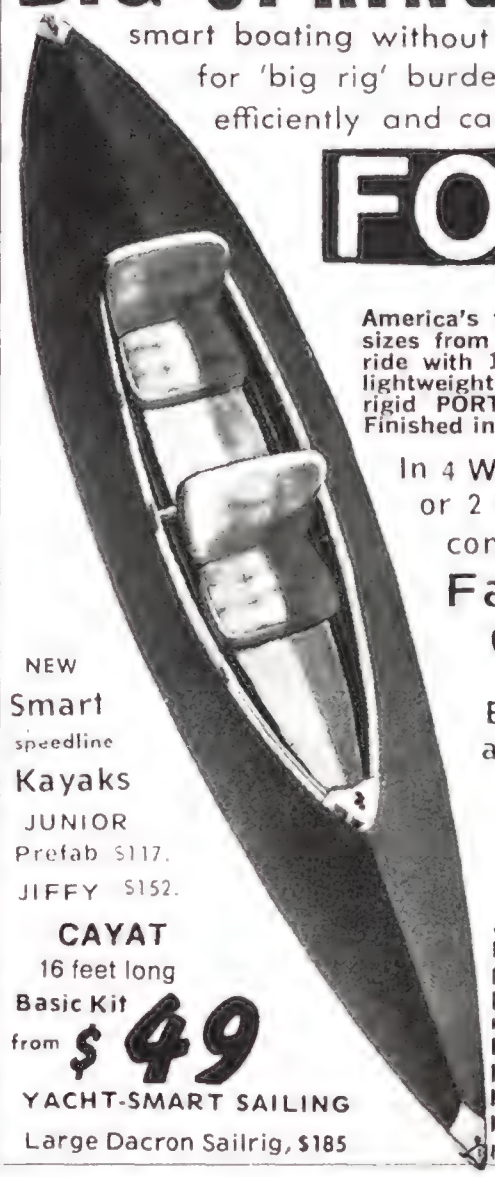

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Domestic Study Tours

History of the Federal City—May 16-20: Origins and development of Washington, D.C.; includes visit to historic districts and Congress while in session.

Shenandoah—June 1-10: Study the geology, archaeology and botany of these beautiful Virginia mountains.

Connecticut Antiques—June 17-24: Visit museums, special collections, historic houses, private homes and noted dealers.

Family Folk School—July 1-7: Handicraft classes, Appalachian history, music and field trips in the mountains of western North Carolina.

Montreal/Quebec—July 7-15: The development of French culture in North America; enjoy museum visits and walking tours.

White Water in Utah—July 22-August 1, September 30-October 10, or October 11-21: Adventure-filled trip explores geology, wildlife and colorful history of Green River.

Colorado Peaks—July 28-August 5: Alpine basin near Continental Divide provides base for camping and hiking.

Alaska—July 29-August 7: Wilderness retreat at Camp Denali introduces natural wonders of Mt. McKinley Park.

Grand Canyon—August 17-27 or August 24-September 3: Raft trip provides excitement, with emphasis on ecology and natural history.

Nova Scotia—September 1-10: Exploration of this ruggedly beautiful area's rich history and varied cultures.

Folk Dance and Music—September 4-9: Rustic, lakeside camp near Cape Cod is setting for both British and early-American folk dancing and song.

Bryce and Zion—September 13-21: Study the geology and natural history of Utah's spectacular national parks.

Toronto—September 18-24: The city's art and architecture; includes visits to the Stratford Shakespeare Festival and Niagara Falls.

California Wine Country—September 30-October 5: Visit selected vineyards for tastings, lectures and discussions with distinguished wine masters.

Archaeological Dig—October 6-13: Join archaeologists in an actual dig, supplemented by instruction, lectures, laboratory work and field trips in Illinois.

Florida Keys—October 28-November 4: Active program offers snorkeling and field trips to study marine ecology.

Washington "Anytime" Weekend: Choose any weekend to visit original Smithsonian building, spend two nights at Loew's L'Enfant Plaza or Hyatt Regency hotels, both close to the Mall, and see other sights in city by Tourmobile. Reservations and payments must be received by the Smithsonian Institution at least ten days prior to arrival.

Foreign Study Tours

Nile Cruise—November 19-December 8: Fly to London and visit British Museum's Egyptian Collection with staff members before continuing on to Cairo. Spend two weeks aboard the M.S. *Delta* cruising up the Nile from Cairo to Aswan, enjoying scenes of daily life along riverbanks and visits to Sakkara, Memphis, El Amarna, Abydos, Dendera, Karnak, Luxor, Valley of the Kings, Edfu, Esna and Kom Ombo. Optional flight to Abu Simbel before returning to States.

Copenhagen to Lisbon—August 17-September 3: Cruise on MTS *Argonaut;* transit the Kiel and North Sea canals; sail up the Seine, Loire, Gironde rivers, with special visits to northern Spain and Portugal.

Foreign Charter Tours

Paris and the French Countryside*—May 14-28: Museum lectures, walking tour of the islands of the Seine and excursions to Chartres and Malmaison plus a choice of a week-long travel seminar to Burgundy, Provence, or to Normandy and Brittany.

Trans-Siberian Express—May 27-June 19: Fly from Seattle to Tokyo for tour on steamer to Nahodka; train to Khabarovsk, Irkutsk and Lake Baikal. Choice of four seminars: Samarkand, Bukhara and Tashkent; the cities of Old Russia; Outer Mongolia and the Gobi Desert; or the full Trans-Siberian experience.

Lapland and Coastal Norway*—June 19-July 5: Celebrate summer solstice; journey through "top of Europe" for unique contrasts of village, forest, moor and mountain; cruise fjords of Norway to North Cape; visit modern cities of Rovaniemi, Tromso and Helsinki.

Scotland*—September 9-23: Enjoy walking tours, visits to castles, abbeys, battlefields and archaeological sites.

Oxford/Smithsonian Seminar—September 14-29: Lectures, field trips and special seminars conducted by Oxford University utilize rich resources of the town and celebrated institution.

Sultans' Treasures*—September 23-October 7: Five-day program in Istanbul followed by one of four excursions to Aegean Turkey or Anatolia and Cappadocia; trip ends in Ankara, Turkey's modern capital.

Spain*—September 30-October 14: Enjoy cosmopolitan Madrid, historic sites in New Castile and one of three travel seminars to Santiago, Barcelona or Andalusia.

Japan—October 21-November 6: Extended program in historic Kyoto and Nara followed by choice of travel to Inland Sea or Sea of Japan. Trip, which originates and ends in San Francisco, climaxes in Tokyo with visits to Nikko or Kamakura.

New Zealand and Fiji—November 21-December 9: Tour includes Mt. Cook, Te Anau and Milford Sound, plus Auckland, Rotorua, Wellington and Christchurch; also talks on natural history, the Maori heritage, parliament and a home visit.

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Selected Studies Seminars

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Man's Quest for Wings—June 3-8: The wondrous history of flight through the eyes of the eminent curators of the National Air and Space Museum. Includes tours and a day at Silver Hill (NASM's preservation, restoration, and extensive storage facility) to view the world's finest collection of aircraft, spacecraft, missiles, rockets, scale models, and many unique items of memorabilia pertaining to famous inventors, airmen, astronauts, and events (repeat of popular program).

Historic House Preservation—June 3-8: Nationally known experts help with the practical aspects and problems of the historic house, the challenges and agonies of restoration, maintenance, and preservation for future generations. Includes how to work with architects, contractors and other professionals; mistakes to avoid; furnishings; gardens; and visits to successful restorations completed or under construction. Coordinated by the recently formed Historic House Association of America.

China: A Cultural History—June 10-15: Prehistoric China to the enigmas of today, with emphasis on intellectual and artistic traditions and the great philosophies and religions. Includes recent films and behind-the-scenes tours of the renowned collection of the Freer Gallery of Art (repeat of popular program).

Aircraft Restoration: How To—Sept. 9-13: Internationally recognized master craftsmen of the National Air and Space Museum's outstanding restoration facility at Silver Hill offer in-depth workshops to familiarize participants with the various numerous techniques. Includes special tours of "museum warehouses" seen by very few people each year.

Please send request for full information on content, accommodations and fees by seminar title to

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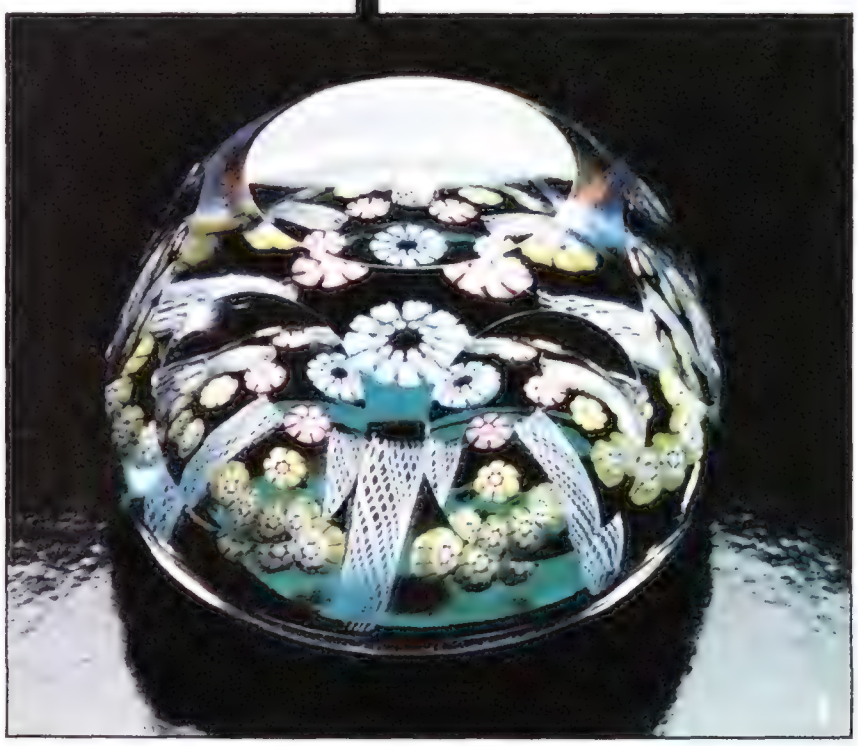

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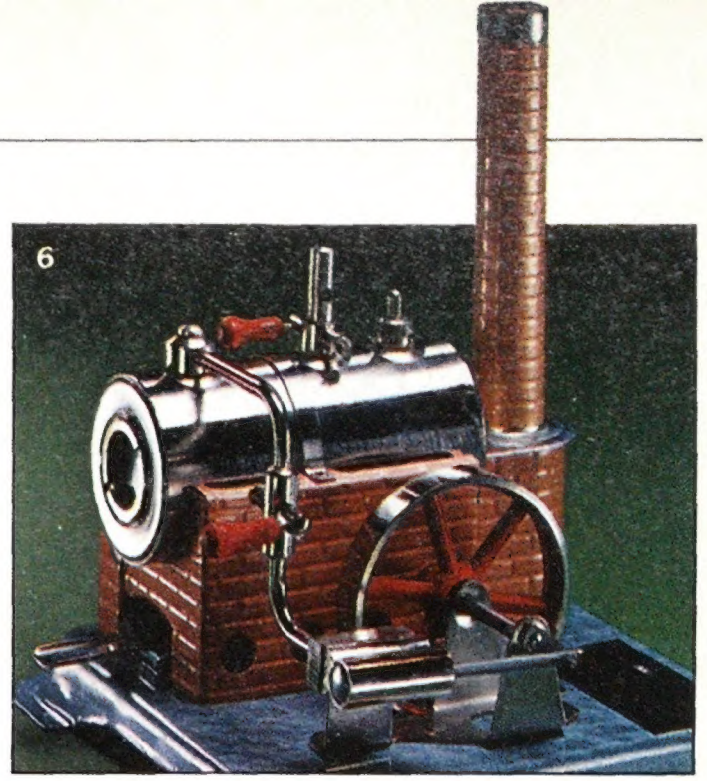
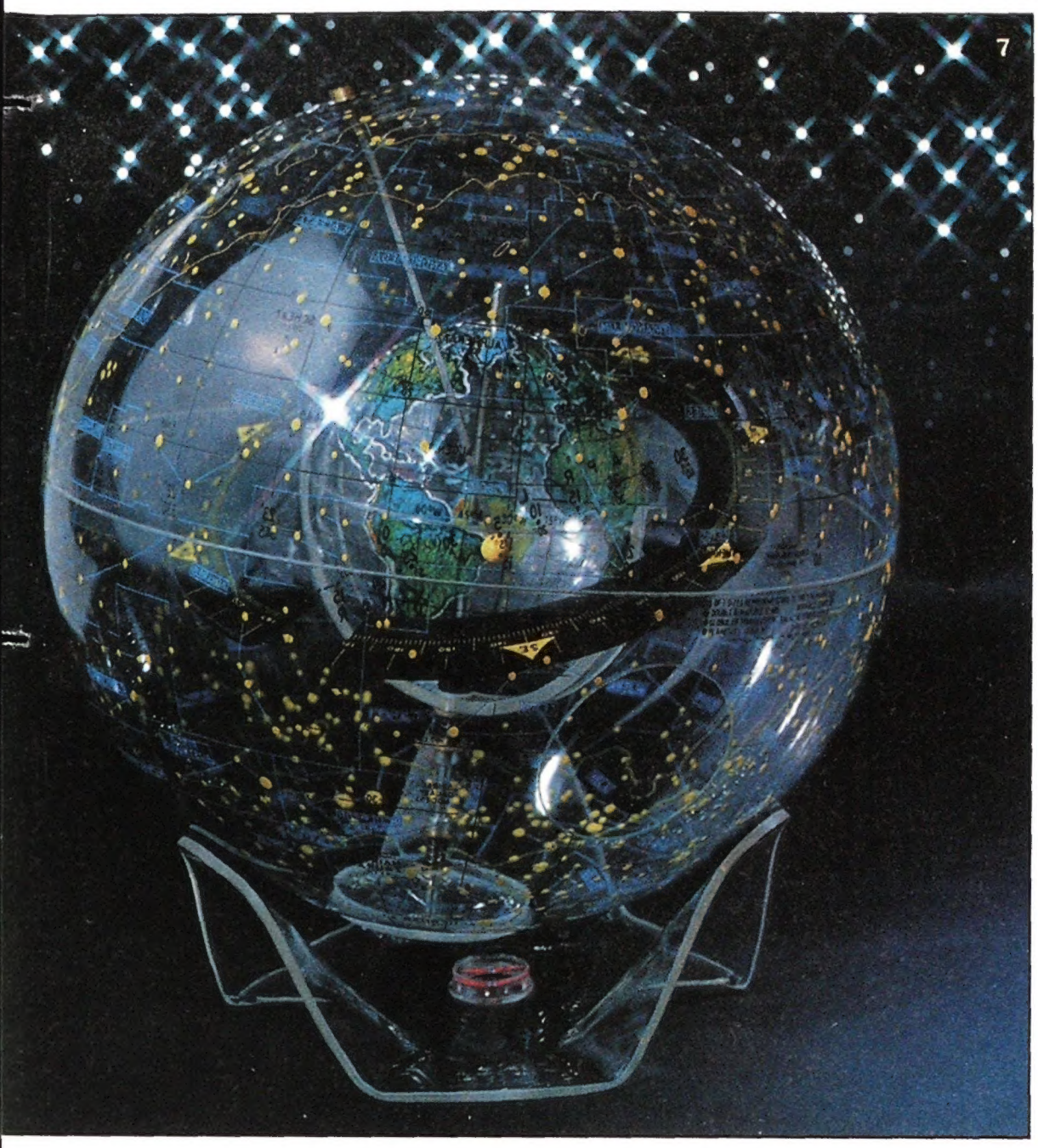
6. FULL STEAM AHEAD by building this working steam engine kit. Several original engines are on exhibit at the Smithsonian's National Museum of History and Technology. Includes parts, instructions, and fuel. Completed size 7" × 7" × 8". For ages ten and above. 624841 $36.00 (Members $32.40) (s/h 2.00).





7. EXPLORE THE UNIVERSE. Our Earth in Space Globe represents some of the aspects of earth and planetary studies at the Smithsonian's National Air and Space Museum. This transparent, acrylic star globe features approximately 1,100 stars, names of all 88 constellations, constellation boundaries, globular and galactic star clusters and much more. Included with the globe are learning aids such as a "dawn and dusk limitation disc," an "instant geographic location pointer," and a comprehensive booklet. 16" diameter. 636779 $165.00 (Members $148.50) (s/h 3.50). Please allow 6 to 8 weeks for delivery.

Make any occasion this spring a special one with a gift from the Smithsonian. The items offered on these two pages have been chosen with all the happy events of the spring season in mind — Father's Day, weddings and graduations — as well as birthdays and anniversaries. And remember it is always a happy day when you give yourself a present. Use the attached order form to have any of these Smithsonian items sent to you.

Visiting the Smithsonian? Be sure to stop in the Arts and Industries Museum Shop at 900 Jefferson Drive, S.W., to see the items shown here.

8. FOR FLYING ENTHUSIASTS. Created exclusively for the Smithsonian, our official National Air and Space Museum tie features the Wright Flyer and the Spirit of St. Louis, two of the most popular aircraft on display at the Smithsonian. Made of polyester in basic navy blue. 326983 $7.50 Members $6.75) (s/h 1.00).

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By Dora Jane Hamblin

New career for Juliet: advice to other lovelorns

It was right there, on the news-service wire. Marie Osmond, the TV star, was being interviewed in London. She, and not Olivia Newton-John, she told reporters, had been first choice to play the female lead in *Grease*. She had turned it down "on moral grounds" because she wanted her first movie to be "a beautiful, tasteful picture." Well, she was asked, would she turn down a *Romeo and Juliet* film on the same moral grounds? "I don't know," said Marie dubiously. "I haven't read the script."

What Marie Osmond didn't know, besides her Shakespeare, was that Juliet Capulet, while not exactly alive and well in Verona, gets 400 to 500 lovelorn letters a month. Hardly an Ann Landers volume of mail, but enough to need the services of a secretary. She gets letters like this:

Dear Juliet:

I am turning to you because you are the symbol of eternal love. Thus you may be able to understand me. I am Serghej G. of Ljubljana. I am madly in love with a girl, but our parents cause trouble. One night I went out of the house to walk in the fresh snow and wanted to kill myself. Then I thought of you, and all of a sudden my life seemed more beautiful. If you can, write me a word to console me. . . .

Dear Juliet:

I am Jennifer, 14 years old, and I am in love with a boy but I don't know if he loves me. I changed my hair today, before I went to school, and he said "You seem different." Does that mean he loves me? Please reply at once. I found your address in a literature book. . . .

William Shakespeare's "literature book," and the agonies of young love, produce letters in a rainbow of scripts and languages, and some weary *postino* at the Verona post office gathers them up and delivers them to the city hall.

There for the past several months a tall, clear-eyed economics student named Paola Sella has taken them home to answer in her spare time. She has become the unpaid, unofficial "secretary to Juliet," as she signs her replies.

No one in Verona remembers exactly when the letters began to come, but they began to be answered in 1937. That was the year the city council of Verona neatened up a crypt in an abandoned Franciscan convent and installed in it a stone sarcophagus which resembles a watering trough but which had been revered for centuries as "Juliet's tomb."

As custodian of the tomb, the city installed Ettore Solimani, a sober man with the outward bearing of a ferocious shrine guard and the inner soul of a Romeo. In those days many letters were directed to "the tomb of Juliet," and Solimani took it upon himself to answer as many as he could. He wrote slowly, painfully, by hand and almost always in Italian, though occasionally he would find university students to help him with the mysteries of foreign languages. For 40 years he signed himself modestly *"la segretaria di Giulietta."*

Last autumn Solimani died, and his unseen, unknown service to the world's lovers was revealed when the *postino* could no longer deliver the letters to the tomb. The new custodian wasn't interested, and the *postino* in desperation took the letters to city hall. There Signorina Sella, who helps out with the annual theatrical and operatic productions in Verona's Roman arena, surveyed the accumulating heap of wistful correspondence and decided to look it over. I met her one day just outside the arena, and asked how she was coping with the job.

"I've not had courage to answer many," she said, sipping her mineral water. "It is a heavy responsibility because they speak, they ask, of love . . . of life. . . ." She was worried that the bulk of the letters came from the United States and Germany, and she could reply in neither language.

Lately, however, Juliet's secretary has found *coraggio*. She has found university friends to help her with English and German, and a stern point of view which has short shrift for "Italian jokers," like the boy who wrote asking Juliet where on earth Romeo managed to find poison in Mantua. "I seek and find none," he complained. Signorina Sella didn't deign to reply. "Better he shouldn't find," she says.

She cherishes instead letters like the one from a 70-year-old American widow: "Dear Juliet: My pain is immense, but I don't wish to be consoled. . . . In the insupportable silence I recall your 'gentle night . . . give me my Romeo . . .' "

"When my parents are in bed and I sit down at my desk to answer the letters, I feel useful to someone," says Paola Sella. "I feel near the whole world, and I have the impression that I am helping to break that ugly circle of solitude which separates one person from another."

So *salve* and *evviva,* love is triumphant in Verona. Marie Osmond could do worse than go right to the source for advice, perhaps starting her letter "Wherefore art thou, Alfie Romeo?"

Authentic.

FEATHER BONNET
With white hackle (feather). Coloured hackles are used in the British Army to differentiate between regiments.

SILVER COLLAR BADGES
The Dewar's Highlander wears the Saltire of St. Andrew, Patron Saint of Scotland.

SHOULDER PIN
In cold weather, or at night, a clansman in the field would unfasten the shoulder pin so that his plaid became a warm cloak or a blanket.

"WING" EPAULETS
To protect the shoulders from sword cuts.

DRUM MAJOR'S BATON
The Scots have marched into battle to the skirl of the pipes, from Bannockburn (1314) to Aden (1967).

SCARLET DOUBLET
Known the world over as the Scottish and British soldier's colour.

GOLD SASH
Always worn over the left shoulder.

METAL "BREASTPLATE"
Worn where belt and sash cross, and carrying the drumsticks symbolic of the role of the Drum Major.

SPORRAN
Originally a leather wallet, worn suspended from the waistbelt to carry the day's ration. There are no pockets in the kilt.

SWORD
with basket hilt. Worn at the belt, it is called in Gaelic the *claith veg*, (claybeg), or small sword, to distinguish it from the *claith mhor* (claymore), or great sword.

KILT
Formerly in one piece with the shoulder plaid, but now worn separately. Highland regiments of the British Army wear the kilt.

PLAID
means a garment, the main garment of early times, which was kilt and blanket-wrap all in one piece. Tartan is the characteristic cloth of Scotland, woven in stripes.

HOSE TOPS
Gaelic name, *caddis*, meaning striped.

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